MINUTES

OF THE

37th MEETING

OF THE

CEOS WORKING GROUP ON
INFORMATION SYSTEMS AND SERVICES

(WGISS)

Cocoa Beach, Florida, USA

14 April to 18 April, 2014

Hosted by the

National Aeronautics Space Administration

(NASA)

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*In memory of our colleague and friend Lola Olsen.  Lola's International Directory Network continues to represent a signature accomplishment of WGISS.  Her long-term dedication and obvious joy in working with WGISS members demonstrated the very best approach and outcomes of international collaboration.  We will miss her.*

# WGISS Plenary Session, Part I

## Welcome, Introductions

Richard Moreno welcomed the participants to WGISS-37, saying he is very pleased to greet everyone, and is looking forward to many interesting presentations. He asked those present to introduce themselves.

## Host Welcome, Logistics Information

Andy Mitchell welcomed everyone, thanking them for their long travel. He noted that everyone received a packet with meeting and venue details, and gave additional information of the no-host dinner, tour of Kennedy Space Center, and group photo. He added that there would be a launch at the Kennedy Space Center this week, visible from the nearby beach.

Andy displayed a map of all the NASA facilities and centers and described NASA’s organizational structure, which comprises Earth Science, Planetary Science, Heliophysics and Astrophysics Divisions. The Earth Science Division’s (ESD) goal is to advance Earth System Science to meet the challenges of climate and environmental change. It seeks to answer the questions:

* How is the global Earth system changing? (Characterize)
* What are the sources of change in the Earth system and their magnitudes and trends? (Understand)
* How will the Earth system change in the future? (Predict)
* How can Earth System science improve mitigation of and adaptation to global change? (Apply)

NASA is an end-to-end program encompassing space missions, suborbital platforms, data and information systems, fundamental research, data assimilation and modeling, application research, and technology development. The ESD has six focus areas: atmospheric composition, carbon cycle and ecosystems, climate variability and change, weather, water cycle, energy cycle, and Earth surface and interior.

## Host Opening Address

Dawn Lowe, NASA Earth Science Data and Information System (EOSDIS) Project Manager, gave the host welcome address. She began with diagrams showing the types of Earth science measurements and sources of Earth science data, and the 2005-14 NASA airborne campaigns. She noted that the role of EOSDIS is to *Advance Earth system science to meet the challenges of climate and environmental change.* NASA’s Earth science data systems directly support this objective by providing end-to-end capabilities to deliver data and information products to users. NASA’s Earth science data policy promotes usage of data by the community, no period of exclusive access, and data available at no cost to all users on a non-discriminatory basis, except where agreed upon with international partners.

EOSDIS provides interoperable distributed data archives, science data processing and management, online data access services, Earth science discipline-oriented user services, and network data transport to distributed system elements. Dawn displayed a diagram of Earth science data operations, and described the extensive data collection. The EOSDIS data collection includes over 6800 data types:

* Land: Cover and usage, surface temperature, soil moisture, and surface topography
* Atmosphere: Winds and precipitation, aerosols and clouds, temperature and humidity, solar radiation
* Ocean Dynamics: Surface temperature, surface wind fields and heat flux, surface topography, ocean color
* Cryosphere: sea/land ice and snow cover
* Human Dimensions: Population and land use, human and environmental heath, ecosystems

The role of the Science Investigator Processing Systems (SIPS) is to perform forward processing and produce standard data products with data from EOS missions, e.g., Terra, Aqua, and Aura, to reprocess standard data products to reflect algorithm improvements and ensure consistent time series, and to provide sustaining support for all SIPS.

Dawn explained that the Distributed Active Archive Centers (DAACs) are built around science disciplines, providing unique support and expert services to their user communities. They also provide data and services to the research community for comprehensive, cross-discipline studies needed to understand Earth as an inter-related system. The DAACs ingest Level 0 data and higher level products produced by SIPS, perform processing of higher level products in some cases, and archive assigned datasets. They also export metadata to ECHO, provide user interfaces, tools, and services, distribute data to users (primarily electronically), and provide metrics data to the ESDIS Metrics System (EMS). The DAACs ensure the safe stewardship of NASA’s data

The NASA Earth Science Data Policy can be found at http://science.nasa.gov/earth-science/earth-science-data/data-information-policy/.

The EOSDIS-wide elements and capabilities include the EOS ClearingHouse (ECHO) - a metadata catalog of NASA's EOS data and a registry for related data services; and Land Atmosphere Near real-time Capability for EOS (LANCE). Near real-time capabilities are co-located with the standard science production facilities.

The User Working Groups represent the DAACs user community and are comprised of researchers and other users, data providers, and program scientists. They assist in defining the DAACs science goals and assessing their progress; provide guidance on DAAC data management priorities; and provide oversight and guidance on DAAC activities, including dataset acquisition, development of value-added products, user support, development activities, and operational functions.

Since 2004, ESDIS has coordinated an independent yearly survey of its users, with the purpose to measure customer satisfaction with NASA Earth Observing System Data and Information System at a national level for each Data Center; to identify the key areas that NASA can leverage across the data centers to continuously improve its service to its customers. The results have provided valuable input to help the ESDIS project and data centers assess current status and improve future services and to assess the trends in satisfaction with NASA EOSDIS.

The ESDIS project develops and maintains the metrics system (EMS), which collects and reports statistics on science data metrics and web activity at the EOSDIS data centers during each fiscal year. Dawn displayed a few metrics and web trends, and listed new missions, planned missions, and examples of international collaborations.

Satoko asked about data access during the post-launch checkout period. Dawn replied that it varies with mission, but can be made available informally to those who request. Richard asked if they provide processing on-demand services. Dawn said that they tried but eventually storage costs dropped so much that it became unnecessary. Richard noted that with Sentinel, they have been asked to provide on-demand processing – which is not a storage issue, but a throughput issue. Dawn reiterated the commitment to provide the products and make them available. The DAACs push the metadata to ECHO and to the GCMD. They are looking into a consolidated metadata repository, which is more efficient for NASA and for the users.

## Adoption of Agenda

Richard Moreno reviewed the agenda and it was adopted with no significant modifications.

## WGISS Infrastructure Support Project (WISP)

Martin Yapur gave the WISP report, listing the members. He also displayed the current WGISS structure diagram from the WGISS website:



WISP provides WGISS with conferencing via GoToMeeting. He explained how to format the presentation file names, and to deliver them for upload to the wiki. Past presentations are archived and available upon request from Anne Kennerley (anne.kennerley@noaa.gov)

Martin explained that the content of the CEOS website includes CEOS goals, mission, activities, data portals, software tools, documents/publications, and meeting materials. The current problem of the website is that it is missing the “Wow!-factor”, it is outdated, and usability and find-ability are lacking. Consequently, the website is undergoing a redesign, with updated look and feel, reorganized information architecture, improved user interface, interesting feature stories, meeting registration, and an integrated document management system. Next steps for this redesign are a CEOS community survey, a content inventory, information architecture design, and updated graphics. The new site is expected to be implemented in time for the 2014 CEOS Plenary.

## GEO Secretariat Report

Osamu Ochiai gave a GEO update and priorities for 2014 from the Ministerial Summit, Geneva, on January 17, 2014. The mandate of GEO through 2025 retains the current nature of the partnership, the general governance structure and the resourcing mechanism based on voluntary contributions, while exploring modifications. The agreement to develop the work of GEO through 2025 was renewed. GEO has 77 participating organizations and nine societal benefit areas (SBA) are linked to the GEOSS portal, with a discovery and access broker, and resource registration. Osamu showed a functional architectural diagram, enabling a system of systems and showing interoperability between GEO DAB and providers. He added that private sector data could feed into the GEO DAB. There are more than 7 million (of 1.2 million GEOSS DataCORE) potentially discoverrable and accessible resources.

Osamu reported that for each SBA and special initiative, GEO Secretariat technical experts and GCI team will assist data providers in the registration of datasets and services to enable discovery and access, particularly GEOSS DataCORE. The GCI team is to develop guidance for users and providers. The GEO Secretariat and GCI team will monitor and evaluate the accessibility of desired datasets in order to identify popular dataset ranking, gaps, usability, etc. Guidance for community portals is being developed.

Osamu reported that overall the implementation of the GEOSS Data Sharing Action Plan is making progress through the Data Sharing Working Group (DSWG). More than 40 organizations, initiatives and projects were contacted to consolidate and expand the GEOSS Data-CORE. Now over 50 million GEOSS Data-CORE resources are potentially easily discoverable and accessible via the GCI and the GEOSS portal. The DSWG has established an ad-hoc working group to propose an updated formulation of the GEOSS Data Sharing Principles for the next phase of GEOSS, taking on board latest advances of open data initiatives observed in many countries and regions. Several options are being developed.

Communications of Network of Networks: New activities (through FP7, IEEE, etc.) were started in 2013 with an aim to enhance the GCI with new data sources and mobile access capabilities. These activities complement each other addressing the challenge of citizen-sensing integration into GEOSS.

The Pathway for the Vision for GEO 2025 is to advocate for the value of Earth observations and the need to continue improving the capacity to observe the Earth; to urge the adoption and implementation of data sharing principles globally; to advance GEOSS architecture as an intelligent information system to allow for integration and visualization of Earth observation data in more meaningful and significant ways (a topic for WGISS); to develop a comprehensive, interdisciplinary EO knowledge base; to define clearly the observations needed for all disciplines, and facilitate that data providers worldwide acquire these observations and make them accessible and available to all users (a topic for WGISS); and to cultivate global initiatives for specific end-use applications to address the multitude of societal challenges.

The GEO priorities for CEOS support (2014) are:

* Coordinated data acquisitions, data access and R&D support for GFOI, GEOGLAM, and Disasters and Supersites.
* Coordinate/support updating and consolidation of observation requirements across SBAs.
* Help increase developing countries’ benefits from GEOSS, in line with AfriGEOSS.
* Easier access to satellite data and derived products (including ECV data records).
* Develop physical architecture for Climate Monitoring from Space.
* Implement CEOS Strategy for Carbon Observations from Space.
* Support implementation of GEO Water Strategy (once released).
* Support Blue Planet, GEO BON . . .
* Respond to new observation requirements for polar and mountain areas (2015) (Cold Regions and Mountain Ecosystems).

Support is needed from the space community to update the GEOSS Portal based on feedback, advance the brokering agreement with new data providers, discuss alternatives for GEOSS registration, and select and implement solutions and establish new procedures. CEOS contributions include IDN, CWIC and FedEO on-going coordination, new search capabilities (e.g., OpenSearch), encouraging more space agencies to contribute their catalog and datasets, making them accessible through GCI. He suggested that data duplication may need to be coordinated.

Additional needed support from the space community includes

* AIP-7 – continuous contributions through e.g., CEOS Water Portal for more feedback from real users and stakeholders,
* SIF participation (WGISS),
* Community Portal paper – Ken McDonald (through NOAA) is leading the component - encourage the discussion in CEOS as well and feedback to the task,
* Encourage ideas on post 2015 GEOSS information system architecture with private sector involvement.

Richard commented that WGISS should coordinate to discuss exactly how to support GEO, and suggested a dedicated teleconference to discuss this; Andy and Osamu agreed. For example, data duplication is a concern that others are working on. Data access is also a primary goal and WGISS can participate with that. The question is where is the best place to have WGISS involvement and to direct input in a more structured basis. Ivan Petiteville is the IIB representative for CEOS and should be included.

**Action WGISS-37-1: WGISS to coordinate with Ivan Petiteville and Osamu Ochiai to discuss structured activities where WGISS could support GEO, and identify the best lines of communication.**

Osamu noted that WGISS has already contributed to GEO in providing the access to 50 million potentially discoverable and accessible resources. Yonsook remarked on the evolution of this system of systems with the satellite data collections integrated in the GCI. At the beginning of the GCI when dynamic access was not possible there was a lot of harvesting; now with live access search, there is less reason to harvest the metadata, and less need to propagate the duplications. Satoko observed that the process to connect to the GCI is very unclear, and asked if there is an overall document for partners. Osamu said they are trying to develop such. At the next IIB meeting Osamu will put these discussion topics on the agenda, including the Standards Inoperability Forum (SIF), which Satoko fears is quite out of date. Yonsook said that when the CEOS OpenSearch document is completed it would be helpful to give it to the SIF team.

**Action WGISS-37-2: WGISS to send to the Standards Inoperability Forum (SIF) team the CEOS OpenSearch document when it is completed.**

## Systems Engineering Office (SEO) Report

Brian Killough, Systems Engineering Office, gave the following reports.

### Data Policy Portal

The Data Policy Portal database includes 318 current and 297 past (since 1990) mission-instrument combinations from 25 countries. 36% are open with no registration, 21% open with simple registration, 5% open but requiring advanced approval, 33% are restricted, and 5% unknown. Considering only current missions, 72% are open; 16% are DataCORE, 21% in the IDN Portal, and 13% in CWIC. Brian listed recent and planned CEOS missions with 121 currently in operation.

Next Steps are to address any new actions or feedback coming from WGISS-37, obtain FedEO statistics from ESA, work with ESA-funded team to include the data policy content in the annual MIM update process for agency approval, and target new CWIC/FedEO partners.

**Action WGISS-37-3: Mirko Albani to indicate instrument/mission combinations that are available through FedEO on the Data Policy Portal. This is a continuation of Action WGISS-36-4.**

Yonsook commented that Landsat-8 is accessible, and she is surprised to see that Aqua and Terra are not accessible. Michael added that they are currently cleaning the DIFs for Aqua and Terra. Yonsook added that the FY-3A is one they are planning to make available but there have been some delays. Brian will send the spreadsheet to Michael so he can update it, and also an email documenting questions.

**Action WGISS-37-4: Michael Morahan to update the SEO’s spreadsheet of instrument/mission combinations noting which are available through the IDN on the Data Policy Portal.**

Satoko said some of the Aqua datasets may not be currently be available. One of the JAXA instruments from Aqua is not ready via CWIC yet, though the data policy has changed, making it available. Brian said that if some portions of the mission are available then it is considered available. Richard clarified the situation with SpotImage and Mirko added that some of these are accessible through FedEO.

### Space Data Management System (SDMS)

Brian noted that many developing nations lack the knowledge and infrastructure to access, process and utilize space-based data for local decision-making and national policies. Countries do not understand how to access the diversity of space data systems and do not have sufficient storage or internet bandwidth to manage relevant datasets. Many UN-REDD and GFOI countries would benefit from a dedicated data system to support national Measurement, Reporting and Verification (MRV) reporting. Such a system would also benefit the Group on Earth Observations Global Agriculture Monitoring (GEOGLAM) initiative.

CEOS, through the SDMS, will facilitate access to space datasets and analysis tools to support country-based reporting and decision-making. This system would be developed by the SEO, with support from WGISS. This is a unique problem since it is a very restricted set of people who may or may not want to share them, though they need to prepare their reports. Getting them the data they need is where CEOS can be facilitators.

The Space Data Management System (SDMS) provides data, including processed images (free or commercially purchased) and cloud-free mosaics (Google, WELD). Users can also upload other datasets and products. It includes data processing and analysis tools, COVE coverage analyzer, scene visualization, Cloud filtering tools (Earth Engine), and infrastructure such as centralized storage and cloud processing. SDMS will deliver data and tools and not be responsible for creating products. Products are the responsibility of the end-user.

The operational plan for the SDMS calls for the SEO to lead the development of SDMS prototypes and related tools and infrastructure. The long-term operations plan is to be determined. These operations may be carried out by other groups within the projects (e.g., GFOI, GEOGLAM, FAO, and SilvaCarbon). Provisions for tool updates and training and capacity-building must be considered.

Brian discussed five prototypes: a pilot study with FAO, Kenya Pilot, Colombia DEM Pilot, JECAM Pilot, and Asia-RICE Pilot.

The SEO requested WGISS support for links to mission archives for the SDMS. He added that the Data Services pilot projects will need data storage and cloud-based computing. They are currently using Amazon services, but would like recommendations from WGISS on other options and long-term solutions. Cost, flexibility, and international constraints will need to be considered:

* WGISS has provided excellent support to the SEO since WGISS-36, but more support will be needed in the coming year.
* The ability to link COVE and other SEO tools to mission archive metadata through CWIC/FedEO is critical.
* Successes since WGISS-36 include SPOT, Pleiades, TerraSAR-X and TanDEM-X.
* Radarsat-2 (with CSA) and RapidEye (with Blackbridge) are in-progress and getting close.
* Future needs are ResourceSat-2 (ISRO), RS, Envisat, Sentinels (ESA).

Kristi asked what the process is for updating the Data Policy portal. Brian said they try to do it twice a year, and an update is coming in a couple of months; updates should be sent directly to Brian. Kristi also discussed issues encountered using a cloud solution, including bandwidth, connections to international networks, and agency restrictions. This is something that can be discussed in Technology Exploration. Andy added that in the future they will be able to tag everything as “CEOS OpenSearch”, and Yonsook suggested just “CEOS”.

## Chair Report

Richard Moreno reported on the following:

* Output of 27th CEOS Plenary: The new CEOS chair is Alain Ratier from EUMETSAT. The Plenary endorsed the membership of the Vietnam Academy of Science and Technology (VAST, Member) and Geoscience Australia (GA, Associate). They also endorsed the CEOS Disaster Risk Management Earth Observation requirements, and agreed to consolidate CEOS Agencies’ response for its three pilots (floods, seismic risks and volcanoes), and the creation of a new standing Working Group on Disasters, with ESA and CSA as its initial Chair and Vice Chair respectively. The Plenary received an update from the Space Data Coordination Group for GFOI on the status of the Global Baseline Strategy, and the formulation of new Space Data Services, and endorsed the creation of a joint CEOS-CGMS Working Group on Climate, adopting un-amended the Terms of Reference endorsed by the CGMS Plenary (CGMS-41).
* Output of 29th SIT meeting: The new SIT chair is Pascale Ultré-Guérard from CNES. The SIT is developing a working group process paper and preparing for the GEO Work Plan Symposium. They endorsed the Recovery Observatory, recommended an update of the WGISS portal, and collaboration with WGCapD in terms of tools and software.
* Recovery Observatory: WGISS will participate in the development of Recovery Observatory infrastructure if the proposal is endorsed by SIT-29. WGISS brings experience from the KALHAITI project, and on data discovery and access (OpenSearch, CWIC and FedEO).
* Synergy with VCs and WGs: Richard contacted all VCs to make an intervention for WGISS-37. WGISS and WGCV have had joint meetings every two years through 2012, and the WGISS chair participated in the recent WGCV meeting, and identified no current shared topics, so no joint meeting foreseen on short term. WGDisasters and WGISS are cooperating in the Recovery Observatory, Supersites, and the flood pilot (and other pilots). WGISS will work with WGClimate on the ECVs and with WGCapD on a repository of software.
* CEOS OpenSearch: The document "OpenSearch GeoSpatial and Temporal Extensions” OGC 10 032r6 comment phase is now closed and WGISS comments were taken into account. The second document: “OpenSearch Extension for Earth Observation” OGC 13 026 comment phase will start soon and WGISS will provide comments on this document. A “CEOS Best practice document” has been initiated.

## WGISS Future

Richard Moreno presented a report on discussions of WGISS benefits and assets, and ways to improve WGISS.

CEOS agencies represent the largest repository of EO data and have major resources to support the acquisition, archive, and distribution of the EO data. They have made major investments in the data systems that provide search and access to the EO data to broader communities of science and application users, and share the CEOS goal of data democracy by improving access and responding to user needs. It is clear that improvements to EO data utilization and access yield societal impacts, benefits to science, and benefits for the private sector. A federation approach to search and access of EO data eases the work of users, enables sharing of tools for development and utilization, produces compatible services and applications, and promotes search and access methods alignment. Agencies make major investments, and need concrete benefits to justify future missions.

Given this background, the assets of WGISS can be described as:

* WGISS activities are connected with and complementary to the work of the Virtual Constellations, and WGISS is serving GEOSS for data access and discovery. WGISS members can take back to their agencies ideas and re-usable software for data utilization. With the IDN, about 15000 datasets are discoverable, and with CEOS OpenSearch about 2000 datasets. This means that about 70 million granules from worldwide agencies are discoverable and accessible.
* Emerging Technologies: Information technology is evolving fast and is not driven by space applications. WGISS shares information about emerging technologies that can be used in EO data systems, most recently cloud computing and big data. Agencies can share experience and expertise on the latest technology trends, and find possible collaborations; this leads to better decision making.
* WGISS develops white papers, best practices and lessons-learned documents. Recent examples of these are the CEOS OpenSearch best practice, the CEOS Interoperability Handbook, and the Long Term Data Preservation guidelines.
* WGISS develops systems that can be operational, such as the IDN for data discovery, CWIC/FedEO for search and data access, and Recovery Observatory for post disaster management.
* Coordination and alignment of CEOS agencies data systems can only benefit user communities. This results is alignment of search and access methods, benefits from data systems investments from other CEOS agencies, and sharing information about common standards, best practices, guidelines, and software tools.
* Agencies can work together under the CEOS umbrella without having to have formal bi-lateral agreements.
* WGISS can also support bi-lateral interactions, by discussing the best practices and guidelines in a multilateral forum. For example, an agency comes to WGISS and sees CWIC activity, or gets ideas from presentations at WGISS meetings, and bi-lateral agreements can develop.

Areas where WGISS can improve:

* WGISS Participation: CEOS agencies state that they cannot afford to participate in multiple WGs or VCs; lowering the perceived hurdle could attract more members. Historically WGISS has been able to attract members of CEOS that do not actively attend CEOS Plenary meetings. It should be clarified (on the website, SIT and Plenary meetings) that WGISS participation at meetings can be accomplished remotely and members can participate in individual working groups and projects without dedicating large amounts of time resources.
* WGISS Success Criteria: This is a measure of the true impact of WGISS efforts and will validate its relevance. WGISS should be recognized as the CEOS reference for ground segment IT subjects. WGISS should coordinate/collaborate/connect more closely with SEO. Agencies want to improve the usage of their data, and WGISS is trying to help with that, in collaboration rather than competition with other CEOS groups.
* Outreach: WGISS should improve outreach to all of CEOS (including VCs, WGs and ad Hoc teams), increasing the visibility of WGISS at the CEOS Plenary/SIT level. Many non-WGISS members of CEOS are trying to tackle the same issues that WGISS is addressing, so it is desirable to communicate the value of coordinating and improving data systems and services. WGISS can do more to raise awareness among the CEOS member agency leaders regarding the importance of data utilization and the need to overcome access barriers through interoperability, in part through the use of open source components. WGISS should communicate the benefits of interoperability, of streamlining processes to reduce manual effort, reduce error, and deliver services more effectively, saving time and money. A synthesis of WGISS activities for SIT and Plenary with outreach in mind will aid communication, provided it is appealing and not too technical. Relevant application side meetings or workshops at SIT or Plenary increases WGISS visibility (technology exploration, interoperability, data preservation). WGISS also needs to improve its website.
* Tangible Effort: Work with users to develop user-request-oriented system/data. Continuous discussion / brainstorming / information are also very important activities, a strong focus on CEOS agency related issues and not just interoperability of the systems. The Technology Exploration Interest Group has made it apparent that many agencies are struggling to solve the same problems. For example, it may not be an agency’s top priority to be interoperable with another agency but that agency could have best practices for implementing cloud computing that could benefit others in WGISS. WGISS should capitalize on its expertise for producing Best Practices and Lessons Learned documentation and sharing architectures/software, etc.

Andy asked what the next steps would be. Richard suggested focusing on a reasonable number of points, noting that some of the points are easy to achieve. Andy suggested breaking it down by sections, and addressing one at a time. Andy reminded of a folder that was generated in the past that described WGISS, and commented that it would be nice to develop a high-level, concise brochure for conferences. Yonsook said when working with some other group, that WGISS request that they mention the contribution of WGISS when giving a status at Plenary or SIT meetings. Andy mentioned discussing with WGCapD last week about communicating to the field what the WGs are doing; they are very interested in working with WGISS and promoting the work. Richard added the need for a list of software.

Satoko commented that GEO has been brainstorming on what they can do and from this came the notion of a one-page high level document describing what they do; this would be a good direction for WGISS. Richard highlighted the need to have a focused discussion with Osamu to prioritize the needs of GEO that WGISS can manage based on expertise and resources.

Wyn asked about the CEOS 3-Year Plan. Richard said that Kerry Sawyer has done a massive effort to put this together – the document is not finished from lack of information from a few groups. The document is for CEOS, and includes actions for WGISS. The WGISS 5-Year Plan was a combination of structure and progress and it would be useful to separate these. One of WGISS’ actions is to review the ToR; it does not have to be very long and should be kept in line with the CEOS 3-Year Plan. Richard said he was very impressed with the work Kerry had done.

# WGISS Collaborations

## CEOS WGDisasters

### Recovery Observatory

Richard Moreno gave Steven Hosford’s presentation to the recent SIT on the Recovery Observatory (RO). The SIT endorsed the setup of one RO. He explained that the idea of the Recovery Observatory stems from the current ad hoc approach, lack of coordination and cooperation, lack of institutional links, and lack of awareness of the role of EO during the three to five year recovery after a major event.

The plan for the Recovery Observatory is to organize EO data from the response and pre-disaster phases into a repository, and to plan coordinated acquisitions to support built area damage assessment, natural resource and environment assessment, reconstruction planning and monitoring, and change monitoring.

The RO implementation oversight team (CNES, ESA, JAXA, NASA, and ASI) was created summer 2013, and proposes one observatory as part of Observation Strategy 2014-2016. The RO builds on the success of the CEOS Charter, Sentinel-Asia and KalHaiti projects. A detailed analysis is complete and the Recovery Observatory is ready for triggering by 28th Plenary (November 2014), with the preparation phase to be completed April 2015. Next steps include:

* Preparation (conditions for triggering, infrastructure establishment, liaison with DRR stakeholders, generic planning) – begins now!
* Cold storage
* Triggering
* Operations (3-5 years)
* Closing

The Recovery Observatory data requirement overview is as follows:

* EO data requirement is limited because area of interest is small – only concerns affected area.
* EO data during response would be covered by International Charter – agreement with providers required to place data and Charter products in Observatory.
* Data for recovery limited to monitoring at regular intervals – weeks or months initially, then quarterly.
* Effort from agencies can be on best effort basis after initial “critical mass” is secured.
* Critical mass refers to key data sets over affected area to establish situational awareness (during response) and track change over time; high resolution optical and radar data before and after event, and at regular intervals (weekly or monthly, then quarterly).
* IT infrastructure required to organize data (linkages to distributed storage, meta data, related products archive, forum for users).

The RO Oversight Team is addressing the issues of IT infrastructure and related planning, outreach to stakeholders (Red Cross, UNISDR), involvement in partnership (triggering), and EO data licensing – moving from ad hoc, diverse licensing to standard approach. Eventual use by RO contributors.

Preparation Phase 1 (through November 2014):

* WGISS begins consultations on IT infrastructure, canvasses potential contributions; architecture defined. Basic IT architecture put in place.
* Recovery Observatory Oversight Team to initiate dialogue with international DRM stakeholders. Synergy with 2015 WCDRR activities for the selection of the stakeholders.
* Initial RO activation plan to be in place by November 2014.

Preparation Phase 2 (November 2014 – Mid 2015):

* Long-term IT architecture established; transfer to new architecture of RO already triggered. Otherwise, beginning of cold storage.
* Data licensing discussions.

### Recovery Observatory Infrastructure Proposal

Richard Moreno explained the context and CNES experience of the Recovery Observatory.

The functionalities which would be necessary for implementing the RO are to offer a collaborative access to databases and to develop networks of users. CEOS agencies will essentially provide data to the Observatory, mechanisms must be established to allow participation of partners who can provide value-added products and services.

CNES has already provisioned resources for the development of a new Kal-Haiti server. Instead of developing a dedicated tool, CNES proposes to develop a more generic tool for the RO, involving all the CEOS agencies for the specification, amended by WGDisasters / WGISS, and using existing pieces of software or resources (if applicable) already available from CEOS agencies. The first basic version is planned for October 2014, and the full version around the middle of 2015.

The expected user communities of the RO are international users, stakeholders, and organizations with a mandate tied to the recovery of major disasters and a major stake in supporting recovery efforts. Others include local authorities, organizations and volunteers.

Three implementation approaches are possible:

A dedicated Recovery Observatory per triggered disaster

A unique and shared Recovery Observatory for all the triggered disasters

A unique and shared Recovery Observatory for a subset (e.g. for one agency) of triggered disasters.

Examples of accessible data types include high and very high resolution optical imagery; high and very high resolution radar imagery (X, C, L-bands); airborne data, in-situ data, and ground truth. Others include user products from the contributed data, maps (reference layers, thematic maps etc.), and public data.

The services provided to users on these data will depend on their types: visualization service for optical imagery (full resolution through WMS); full text search for documents; and automatic harvesting of external catalogs (e.g. CSW endpoints).

Data access can be “Google like” or “Google map like”, and will be sorted with implicit search criteria. Data search and result display can be cartographic display, with search and results tabs, sortable lists, faceted search, bookmarking, semantic and full-text search. There would also be email alerts and tag management on objects.

Provided services will include processing on demand, WPS services, data description improvement based on systematic tagging from exogenous data, notification services, and event management. Centralized user management for all features will be used, and user profiles will be available. Data licenses will also be managed.

The architecture will be based on a web server (or a set of web servers), be scalable, elastic, and load balanced. Localization will be defined, and performance and data volume will be specified. The system must be flexible enough to adapt to specific disaster types, and use standards in order to ensure data access interoperability.

Andy noted that they need to consider approaching the cloud technology carefully, since agencies may not be willing to put their data on commercial clouds. Richard suggested handling this on the basis of data sensitivity and agreed that it definitely must be discussed and considered. Thomas Cecere asked how much of this is CEOS work, and how much is GEO work. Richard replied that this is more of a question to WGClimate, and WGISS is only dealing with IT/technical issues. Karen confirmed that CEOS is working closely with GEO on the activity of the RO, and the associated three pilots that CEOS has approved are loosely coordinated with GEO. The GEO lead for disasters has been participating in the discussions, and GEO is looking to CEOS to build this capability within the GEO environment. Within WGISS the work will be on consensus agreement, with the participation of everyone.

Karen commented that this is an exciting and comprehensive idea. One of the lessons learned previously is that these have to be “systems of systems” and are by nature hybrid and distributed. WGISS may be able to contribute the keys for interoperability for these various subsystems, and be focused on dealing with the information content for the satellite data products that can be used in disaster scenarios. Different groups talk about disaster management in different ways and the common layers should be sought and built on. Distinguishing what is in metadata, what is collection level and what is data product level is a difficult problem.

Nitant asked if there are any plans for CWIC to have a role in this project. Richard said yes, definitely. Yonsook added that with five operational data partners and five more in the near future, FedEO, and JAXA’s OpenSearch, much searchable data becomes available. Those with more accessible data can become CWIC or FedEO partners. The IDN has a team in place to add the needed keywords. All these capabilities can be made accessible to the RO, and it will be interesting to see how it comes together. CWIC will provide tools to any partner to do the development of the data access.

In terms of project management Richard said that discussion is needed on the organizational structure in which the work will be accomplished – within a WGISS project, an interest group. There is room for an interest group dedicated to disasters, with a liaison to WGDisasters. Andy suggested that the proposal document be distributed to WGISS-All, asking for formal feedback. WGISS needs to endorse its participation indicating which agencies will participate, and Richard added that he hopes most agencies will agree to participate and to work together. Resource requests from agencies can be quite light.

WGDisaster agency participation is very high. Yonsook added that if any of those agencies do not have a WGISS counterpart, WGISS can reach out to them. Satoko noted that since the timing is very short, she recommends creating a WGISS project during this meeting, and Richard suggested an interest group for Disasters and a project for the RO. Karen added that the WGDisasters have recognized the expertise WGISS has, but WGISS needs to get recognition from them. Richard said this has essentially already happened at SIT last week, and this is an example raised by the SIT chair of collaboration between working groups.

## CEOS WGDisasters Joint Session with ESIP Federation

### Introduction

Karen Moe introduced the session, welcoming the participants from the Federation of Earth Science Information Partners (ESIP). She explained that the goal of Terminology => Taxonomy => Ontology => is to provide a basis to develop tools for discovery and use of satellite-derived products. Areas where the keywords will play a role are IDN/GCMD collections, dataset landing pages and documents, social network tagging, linked data content, persistent identifiers, metadata content, and Provenance for Earth Science (PROV ES). She showed a diagram of semantically enabled scientific data integration: SESDI methodology, and noted that the OGC is a resource for best practices for emergency and disaster management.

### CEOS Disaster Risk Management Pilots as a Use Case Scenario

Stuart Frye explained that the purpose of this effort is to improve delivery of satellite data and products for societal benefit in a local/regional setting, and on a global scale, by developing and infusing Earth Observation monitoring and modeling technology for data acquisition, processing, and product distribution for disaster applications. Experience is based on CEOS and GEO activities. The CEOS DRM Pilots address ground validation, crowd sourcing, and hand-held clients to validate disaster products and services, and perform capacity building to infuse standardized web servers and clients that provide open access to critical disaster management information, data, and maps via the internet using common, open desktop tools.

Stu gave an overview of the CEOS DRM pilots for floods, seismic risks, volcanoes, listing target areas. He stated that detailed EO requirements for each pilot were approved at the last Plenary. The pilot definitions included types of data required, frequency of observations and polygons of interest, etc. The pilot EO requirements were submitted to the Data Coordination Team made up of representatives from CEOS agencies. Agencies’ responses were analyzed and consolidated by the Data Coordination Team and pilot leads. The analysis included trade-offs between pilots (e.g. Pleiades data to be used in priority for volcanoes and seismic hazards), synergies across pilots (volcanoes and seismic hazards) and possible overlaps with other major initiatives (GEOGLAM, GFOI in S-E Asia, Supersites). Stu listed a summary of the data contributions from CEOS agencies, and displayed tables showing how data will be exploited for each of the pilots.

Agencies confirmed the majority of contributions and some options are still being worked. The main issue is that data contributions are for R&D activity; should some activities become operational after 2016, funding is required to ensure sustainability. The consolidated response from space agencies is very positive; volume of EO data and products confirmed is similar to or greater than what was initially provided for Forest Carbon Tracking and for JECAM. Main objectives of each pilot can be reached with the firm contributions announced. Refinement for data is ongoing, and some specific imaging requirements are being reconsidered given trade-offs between agencies: how to best exploit synergies.

User challenges are as follows: Users are split into three categories (satellite operators, international/national/regional agencies), and their needs/desires are different. Users want products to be accessible using tools they usually have and want map-based products. There are hidden services that the users will expect without necessarily knowing they need to ask for it, like map services, product processing, tiling, compressing, terrain correction, and delivered products can be easily validated/corrected by non-experts.

### GeoSocial API Architecture and Demonstration

Pat Cappelaere explained that the Open GEO-Social API is a vision to empower people to quickly discover, share, and mimic to turn (Earth Science Data) products into (societal) actionable information. Agencies have a mandate to provide information (not raw data) to society, visible quickly on the internet. The current OGC standards are too level and focused on web services; security is difficult, and data formats are too hard for users, and the focus needs to be on disadvantaged users. Other problems include a distributed architecture with many “cooperating” nodes, data publishers and communities. A global view can be achieved by fusing data from many regional nodes. The users are highly varied, and users want to specify products, locations, actions, and dates. An open GEO-social API provides many advantages. Pat displayed a diagram of the flow of data to users and described software technologies for data formats, maps, hypermedia API, security/authentication, and tagging, and listed the participants of the project.

Richard commented that it looks a lot like what they want to do for the RO and asked if it is open source. Dalia Kirschbaum said the system will be hosted and anyone will be able to access the information. The concept is that the data can be viewed from computer and smart phones. They are in the process of applying to NASA to release the source code under certain agreements. Certain other groups in CEOS can also most likely get it.

### Global Landslide/Flood… Tagging

Dalia Kirschbaum discussed the Open GeoSocial API from the point of view of landslide/flood events. For example, sharing of landslides on GitHub immediate visualization, with no tools by the user, with GeoJSON, TopoJSON distribution formats. The difficult part is proper tagging; there are several tag layers: science tags, Geonames tags, GitHub tags, and GeoSocial tags. Dalia explained that characterizing the range of landslide sizes, types and triggering factors is impossible to accomplish by one group/agency. The Global Landslide Catalog (2007-2013+), is a database with the foundations for landslide hazard, including 5700 events. Information included in the catalog includes date, coordinates and country, nearest geographic place, hazard type, trigger, fatalities, impacts, location accuracy landslide size and source.

The tagging strategy is based on GLC archive, developing a list of defining characteristics for landslide hazards (all types) based on available fields. The list is sent to several landslide experts for comment, to create first version in online database, and revise based on user feedback (if needed). Realistic tagging is date, location (nominal, latitude-longitude), and fatalities. More challenging is trigger type, movement type, confidence in location, other impacts (injuries, houses affected, roads affected), and situation of the landslide (occurred along a road, near river, burned area, etc.). Note that many of these tags are relevant to other types of event. General users want to know different things than science users.

Dalia gave an example of GitHub version control tags; she added that if you want to have users discover your science products using storytelling and sharing on social networks, you need a few more tags (GeoSocial tags). There needs to be agreement on namespace, product names allowed for queries of standard products of GEOSS interest.

Kristi Kline suggested they looked at the naming conventions used for the climate records.

**Action WGISS-37-5: Kristi Kline to discover a list of CDR/ECV nomenclature to send to the ESIP Federation.**

### Recovery Observatory Infrastructure Proposal

Richard Moreno gave an overview of the RO infrastructure for the benefit of the ESIP Federation participants.

### Emerging Earth Science Technologies in Disaster Management

John Evans reviewed emerging earth science technologies that can be used in disaster management.

* Small satellites: examples are Surrey/DMCii Disaster Monitoring Constellation, China Environment and Disaster Reduction Huan Jing Satellite Constellation (HJ-1A,B,C) have the potential of dramatic increases in spatial, temporal resolution; 32 polar-orbiting satellites => ½ hour revisit.
* CubeSats: examples are Planet Labs “Dove” constellation, Surrey STRaND-1 CubeSat, Interorbital Systems.
* Unmanned aerial systems (drones).
* Crowdsourcing via mobile devices: examples are FEMA Disaster Reporter app share GPS photo reports, SMS in Port-au-Prince earthquake, Quake-Catcher network, Boston “Street Bump” app.
* Internet of Things: sensor-based detection of earthquakes, forest fires, oil spills, severe weather, volcanic gas plumes, drought.
* Cloud computing: Detect event => scale-up computing and storage capability in minutes – scale back down after crisis.
* Big data analytics: Detecting patterns and correlations and Monte-Carlo ensemble simulations.
* Other potentially game-changing technologies are Model Webs / Modeling as a Service, Semantic Services, Collaboration services, Satellite Direct Broadcast / Direct Readout, New sensor types.

John discussed how to integrate new technologies well; need to understand / develop / adapt technologies with greatest likely impacts on disaster management, to envision what new analytical or operational capabilities these technologies may enable, and where they will matter, and to rely on widely-adopted, consensus-based standards.

John suggested taking on the job of looking at the data information requirements and see what needs to be added, and articulate a process that reflects what they have done to replicate in other disaster types. He is looking forward to bridging between these two groups ESIP Federation and WGISS. Disaster thematic keywords should be articulated by ESIP and presented to WGISS for review and to provide feedback for complementary purposes. Keywords are a common theme – leverage with technology.

## WGClimate

John Bates, Chair of CEOS-CGMS Working Group on Climate began saying he is hoping for collaboration with WGISS as there are several activities in common. He displayed a diagram of the Essential Climate Variable (ECV) Inventory Logical Architecture View. Although the logical view is very useful for explaining the big picture, it has limitations: It does not give visibility of the part of the GCOS requirements baseline that is ECV-specific and generally non-functional in nature (e.g. ECV-specific requirements on accuracy, frequency, coverage, stability, etc.) It also does not give visibility on the part of the GCOS requirements baseline that is generic (i.e. common across all ECVs) but not functional in nature – e.g. provision of documentation on algorithms used. Another view is needed which could capture all aspects of the GCOS Requirements baseline, as well as provide a means of overlaying the various space agency contributions.

A “Physical View” was constructed to complement the “Logical View” and became known as the “ECV Inventory”. This ECV Inventory was designed from the outset to fulfil a number of objectives, such as representing the full scope of the GCOS Requirements baseline (including the Functional View). Other objectives are to act as a repository for representing the current ECV-relevant data-holdings of agencies in a manner that exposes their degree of compliance with the relevant GCOS requirements, and act as a repository for representing the planned ECV-relevant data holdings of agencies.

John explained the structure of the questionnaire and displayed sample extracts of the questionnaire that were released to agencies in 2012; this questionnaire was designed to ensure that every aspect of the ECV inventory is addressed.

In summary, the logical view is a very useful entry point - generic (common to all ECVs) and describes in a readily accessible format the main processing steps. But it does not give the full picture as it is not a suitable format for capturing non-functional and ECV-specific requirements (e.g. accuracy, stability, coverage, documentation needs, etc.). In contrast to the Logical View, the ECV Inventory contains the complete picture (i.e. the full GCOS requirements versus their current and planned implementation status) at the level of individual ECVs but, unlike the logical architecture, is not succinct. The ECV Inventory is the essential component/mechanism for the fulfilment of the three main objectives assigned to this Working Group. Looking to the future – if the structure of the GCOS requirements baseline changes (e.g. introduction of application-specific requirements within ECVs) then this may have a direct impact on the ECV Inventory.

Potential WGISS-WGClimate interactions are in the areas of data stewardship, properties and access. John said that he wants to inform WGISS of the work; SEO is helping to build tools. This is an exciting database of information content, and will be a release of the first iteration of the ECV database. He expects a number of different application layers, and would appreciate any questions and feedback, and suggested future collaboration.

Yonsook asked what kind of data access is he talking about. John replied that they will have a version1 release of the database, and could envision an interface where you know what the content is, and access that way. The database is not very large, a copy can be downloaded; it is worth looking at the content to identify potential uses. Looking for information on how to provide that access is an area for future discussion. Ken McDonald asked about the status of the database itself and who is involved in maintaining it and updating it, and how the survey process is occurring and what is its status. WGISS did a survey of CEOS space agencies two years ago and found it was more challenging than was thought at first. It involved archiving, processing, and quality, and the information content is perishable and changeable and keeping it up to date is a challenge.

Karen noted that data discovery is separate from data access for an outsider. John replied that they are working with NOAA’s National Climatic Data Center on the area of discovery. Andy Mitchell asked Brian Killough what the correlation is between ECV database, MIM, and others sending out surveys to CEOS agencies. Brian said they are trying to work with other entities in CEOS to make sure they are not overwhelmed with data calls. They are at a pause right now to make sense of what they have before going out to the agencies with additional data calls. Brian said his team is working with George Dyke so that when users are at either site (MIM, ECV database) they have the ability to move over to the other. The intention is for both to be linked.

## GEO Climate

Glenn Rutledge gave a presentation on the GEO Climate Task CL-01 C4, for which he is the lead and point of contact. The goal of this task is “Easy Access, and Use of Climate Information”, and C4 is a GEO revitalized and developing team as of March 2014. He listed priority USA actions which include ensuring the delivery of the useful climate information needed for adaptation through the GEOSS Portal; development or adoption of guidance documents of key climate interpretations and understandings necessary for informed decision making, including modelling output. Additional actions are to build upon existing “Climate Services” portals and clearinghouses such as the US portal “climate.gov” and the European Clearinghouse on climate change impact, vulnerability and adaptation; exploration of linkages from/to GEO Common Registry (CGI) to climate.data.gov CEOS CWIC and others to be determined; and leveraging of climate.gov and WMO’s Global Framework for Climate Services (GFCS).

Glenn noted that at present there is considerable experience in many of the technical, practical, and institutional aspects of climate services. Climate adaptation requires not only portals to data, but guidance for use by climate service providers, communities of practice, and policy makers. Climate, seasonal, and inter-annual models are readily available yet practical information and use of climate information is lacking. Accessing and analyzing the utility of historical climate information (observations, reanalysis products, remote sensing and merged analyses) and how they are useful in a decision context needs further development. Practical guidance for the use of: seasonal forecast information (statistical and dynamical models, global historical datasets, ensemble prediction), validation, probabilities, and assessing skill. Provide understandings to longer term climate projections (IPCC products, indicators, and scenario generation and decision applications) thru GEOSS. Reference information on approaches to decision-making under uncertainty (e.g. with less than perfect information – how to avoid analysis “paralysis” and focus on what we know, including what we know about extreme events).

Glenn displayed a graphic of the Global Framework for Climate Services (GFCS). He also listed cross-task activities and path forward in the areas of ensuring delivery of the climate information needed for adaptation through the GEOSS web portal, building on existing climate services portals, and building upon WMO Global Framework for Climate Services.

Opportunities for collaboration exist for GEO Climate Task CL-01 with (at least) two WGISS initiatives: CWIC and the GEOSS Community Portal, and WGISS-37 is the initial coordination activity for CL-01.

Richard commented that to connect to CWIC they should use the OpenSearch standard. Glenn replied that he plans to look into the connection in the near future. Martin said given all the GEO activities, it would be beneficial to WGISS to have you as a liaison with GEO. Glenn said he would be pleased to take this role. Glenn will represent (as appropriate) WGISS as GEO Climate Task lead, and as a member of the Societal Benefits Implementation Board (SBIB).

## ACC Portal

Stefan Falke gave an update on the Atmospheric Composition Portal (ACP). He listed the ACP mission statement, and explained the goal, which is to help in understanding which datasets are available, their key characteristics and assumptions, how they can be accessed using standards-based interfaces, how others are using them in science and applications. Which processing, analysis and visualization tools are available, how others are using those tools, and how to make data, tools and analyses available. To this end, two aspects currently being advanced: a data table, and contextual information.

The ACP Data Table provides quick and easy to use list of AC data available across the community, allows different user groups to filter list to identify datasets relevant to their need. It is also intended as a launching point to additional metadata, data access, and other information, and to provide atmospheric chemistry and aerosol products. Provides in-depth view, and summary view. As other views become necessary, it can be tailored to that. The bulk of the work occurs in coordinating with others in developing best practices for OpenSearch and ISO 19115.

Contextual Information is filtered, aggregated and curated information about remotely sensed atmospheric chemistry and aerosol data. Semi-automated search, filter, process, aggregate. Includes science team reference documents and standard metadata records.
Contextual Information includes journal articles, RSS feeds, social media, and Wikis.

Stefan gave an example of contextual information with journal articles. Insert text analysis tools (UIMA, GATE, etc.) in order to more accurately identify relevant journal articles that made use of particular datasets, and understand how the journal authors used the dataset. He also listed the ACP technical team.

Ken McDonald asked if the activity of building the data table and interfaces to IDN and GCI is using the existing interfaces – Stefan said that yes, they are using the currently available interfaces. Richard asked about the relationship of the ACP with the DLR WDC ERSAT Portal; Stefan replied that it is the same effort, and the ACP website is hosted at DLR.

## Precipitation Virtual Constellation

Steven Neeck began his presentation on the Precipitation Virtual Constellation (P-VC) saying that the implementation of CEOS P-VC is in four phases. The study phase (2007) included startup activities and survey existing P-VC member multi-satellite products: NASA TRMM 3B42, JAXA GSMaP, NOAA CMORPH/QMORPH, NRL-Blend SRE, and EUMETSAT MPE. The GPM preparatory phase (2008-2013) involved a comparison of different methods of inter-calibration for generating uniform precipitation estimates from diverse types of precipitation sensors, evaluation of different multi-sensor precipitation products, and the prototyping of uses of merged data products from multiple sensors as well as evaluation of tools to support such use. The GPM phase (2014-2018) consists of the launch and operation of GPM, the first constellation-focused mission that will improve precipitation estimates through extensive intercalibration and the use of a reference standard. Post-GPM phase will be after 2018, and is beyond timeframe of GEOSS 10-Year Implementation Plan. The lessons learned from GPM and other P-VC activities will serve to guide the planning and further evolution of CEOS P-VC.

Steven listed the 3-year outcomes of the P-VC. Their accomplishments include:

* P-VC Data Portal implementation underway; Phase 2 study (function and architecture) prepared and submitted to Co-Leads.
* Precipitation ECV support – GCOM-W1/AMSR2 L2 data publicly available; GCOM-W1/AMSR2 and TMI/AMSR-E intercalibration update; Megha-Tropiques/SAPHIR L2 data publicly available; CEOS P-VC Microwave Imager Availability White Paper Update completed; X-Cal WG meetings at CNES Toulouse Space Center (France) and CSU (USA) as well as weekly videoconferences; GPM Precipitation Processing System processing L1 and L2 data products.
* Deployment of GPM phase constellation satellites and maintaining continuity with TRMM. GPM Core Observatory launched and in commissioning phase and TRMM extended through 3Q 2017 based on 2013 NASA Senior Review.
* Advocacy of post-GPM phase P-VC: CEOS P-VC Microwave Imager Availability White Paper Update completed and GPM FO meeting held on sidelines of 2013 PMM Science Team meeting and Integrated Global Precipitation and Clouds mission concept workshop at NASA GSFC.
* Planning for 5th P-VC Workshop, November 2014, Tsukuba, Japan (on sidelines of 7th IPWG Workshop).
* P-VC ToR completed.
* P-VC engagement with WGs (WGCV-36, WGISS-35).

Steven listed recent P-VC documents and upcoming meetings, and the points of contact of the P-VC.

Satoko asked about milestones related to the data portal. Steven replied that they have submitted the white paper for JAXA review. Following the acceptance of the paper, the next step is to engage with the PC members to provide datasets for the portal. Possible milestone is June. Richard asked what kind of support is desired from WGISS. Steven replied that at this point they are in an exploratory phase, and will be pleased to provide more information on the data portal at WGISS-38. They look forward to engaging with WGISS.

## CWIC External Engagements

Ken McDonald introduced his presentation saying that community portal development is a GEO 2014 priority. The GEOSS Portal is very good, but communities still wish to develop their own interfaces to relevant data and services. Ideally the GCI can support their access to GEOSS-registered resources. To facilitate Community Portal development, a set of recommendations are being developed. The topic is being raised to solicit input from WGISS experts into GEO activity, and to explore potential parallel initiative regarding WGISS infrastructures. Ken displayed a diagram of the GEOSS Common Infrastructure architecture, and of the GEOSS components, which include the GCI and community resources (client, mediation, and access tiers).

The GEO community portal group are developing a paper entitled “GEOSS Recommendations for Community Portals”, which originated as an action from GEO Sprint to Summit. The need was reinforced at the recent GEOSS Vision and Architecture Meeting at ESA/ESRIN, and recommendations to build upon AIP and other experience were made. The team members were drawn from those who have expressed interest in the topic or their nominees; it has architects/engineers associated with the development of the GCI, AIP participants and representatives from GEOSS user communities. Ken listed the members.

The purpose of the paper is to express an understanding of the general needs of the user communities that are developing portals to GEOSS services, to explain the way the GCI can address those needs, to instruct and assist portal developers in utilizing the GCI components, to engage the various user communities in sustaining and enhancing GEOSS capabilities, and to leverage community resources of the GEOSS Information System in addressing access, processing and workflow capabilities. Progress to date includes information sharing, community portal use cases development, and near completion of rough draft.

Ken asked if there is sufficient WGISS representation on the GEO Community Portal Recommendations team, and if WGISS thinks they are adequately engaging user communities, and providing enough support to the potential users of the current infrastructures. Are they capturing and sharing experience of existing client development teams?

Satoko commented that the Water Portal Project team would like to participate in the group. Yonsook asked if they have reviewed the community portals recommendation that WGISS made several years ago; it is still appropriate. Richard said GEO has a generic interface to access data based on GCI, intent now to make community portals, focused on the communities in GEO. Ken said community components at the access, search, and brokering level have always been part of the plan, but have not been facilitated as much as GEO would like, perhaps by gathering experiences and case examples - not as a replacement or GEO portal, but access from it.

If you want to make a portal, do you need supplementary metadata that is already in the GCI? In some case yes, others no – by engaging with the communities these can be made much more accessible to the broader community. In CEOS OpenSearch there is no thematic metadata; it is not covered in the OpenSearch. The OpenSearch provides the mechanism, but there are many other ways to get the subsets, it depends on what the community chooses to do. The VC portals are examples of how they form a subset of the data so that you only expose the part that is needed by the community – targeted data and services. Jérôme said in OpenSearch you can put Atom links for descriptions of granules, giving you an ontological description of the data.

It was agreed that WGISS can provide significant support for this, and there is already WGISS participation in the group. A follow-on of the activities of this group at future meetings was recommended.

# Agency and Liaison Reports

## ESA

Mirko Albani gave the ESA agency report. He began with a diagram of the ESA EO Programme. He detailed the four Earth Explorer missions:

* Earth Explorers-1: GOCE (2009-13) measures Earth gravity field with 1 TB of products by the end of the mission. The 5th release of gravity field products is being processed and will be ready during the summer of 2014. Mission re-entered atmosphere in November 2013 as planned.
* Earth Explorers-2/3: SMOS (2009 - ), Cryosat-2 (2010 - ), to measure soil moisture and ocean salinity, and thickness of sea and land ice. Both are operating well, and missions extension is being planned.
* Earth Explorers-4: ADM- Aeolus (2015), EarthCARE (2016), and BIOMASS (2020), to measure wind profiles, aerosol-cloud-radiation interactions, and understand Earth’s carbon cycle. Development is ongoing.
* Earth Explorers-5/6/7: ADM- Aeolus (2015), EarthCARE (2016), and BIOMASS (2020), to measure wind profiles, aerosol-cloud-radiation interactions, and understand Earth’s carbon cycle. Development is ongoing.

Third party missions, where ESA is distributing data to European users from other agencies, include Proba-V, now part of the EOP Earthwatch Programme. This is a vegetation instrument with 1km and 300 m resolution products.

The next generation consists of the Copernicus dedicated missions. Copernicus is a European space flagship programme led by the EU, where ESA coordinates the space components, and which provides the necessary data for operational monitoring of the environment and civil security. Copernicus dedicated missions are Sentinel-1 (SAR imaging), Sentinel-2 (multi-spectral imaging), Sentinel-3 (ocean and global land monitoring), Sentinel-4 (geostationary atmospheric), and Sentinel-5 (low orbit atmospheric).

Sentinel-1A was successfully launched April 3, 2014. Mirko showed a video of the launch, taken from onboard cameras. Launch and Early Orbit Phase (LEOP) was successfully performed according to planned timeline, though collision avoidance maneuvers with a NASA satellite were carried out successfully in the first day after launch. The first images were captured on 12 April, demonstrating the potential of Sentinel 1A’s radar vision.

The data policy adopted for the Sentinels data is based on free, full and open access. Additionally, ESA EO data policy is free and open for all ESA and TPMs data at ESA with simple user registration needed for data collections available online and project proposal submission for datasets not (yet) available online (e.g. ESA SAR data).

Mirko described the 2013 ESA Living Planet Symposium, where the need for Earth Observation was confirmed.

Alexey asked if there were simulations of the collision avoidance maneuver prior to launch. Mirko replied that this maneuver is generally not simulated during LEOP as it is really unlikely to be needed in the first few days after launch.

## GSDI

Gábor Remetey-Fülöpp, Secretary-general, HUNAGI, presented an update on selected activities of the GSDI Association since WGISS-36, with some examples from EUROGI and HUNAGI.

GSDI is actively involved with GEO. GSDI expert Doug Nebert of USGS is team member of the “GEOSS Recommendations for Community Portals” in the GEOSS Common Infrastructure framework. GSDI experts Ivan DeLoatch of FGDC and Alessandro Annoni of JRC IES DERD are active in the GEO Architecture and Data Committee. GSDI was invited by CEOS to the GEO Architecture and Vision -related discussion held in ESA ESRIN, Frascati September, 2013. GSDI took part in the discussion emphasizing the expected positive societal-economic impact of the use of available and proven open source tools. GSDI took part at the GEO – X Plenary and Ministerial summit with a 3-member delegation Carmelle Terborgh (Esri), IvanDeLoatch (FGDC) and me(HUNAGI).

Africa GIS 2013 and the GSDI 14 World Conference took place in Ethiopia November 4-8, 2013, with 500 participants from 60 countries. Topics discussed were the design and development of spatial data infrastructures.

Gábor reported that besides the INSPIRE, PSI Directive and the European Open Data Policy in the EU, recent Canadian and US strategy and open data policy initiatives will also influence future SDI developments. NSDI Strategic Plan (2014-2016).

GSDI features IGEOS, GIKNET and SDI regional newsletters include International Geospatial Society, Geographic Information Knowledge Network of GSDI, and SDI Regional Newsletters, GSDI & IGS Global News.Gábor listed GSDI members having strong EO links:

* [National Space Research and Development Agency, Nigeria](http://www.nasrda.gov.ng/)
* Taiwan Association of Disaster Prevention Industry - TADPI - Chinese Taipei
* [CIESIN - Columbia University - United States](http://www.ciesin.columbia.edu/)
* European Umbrella Organisation for Geographic Information (EUROGI)
* Hungarian Association for Geo-information (HUNAGI)

Selected EUROGI and Hungarian activities were listed.

Gábor concluded saying that GSDI’s efforts in GEO are to increase the societal benefits of EO by appropriate data sharing policies and a common technical architecture including interoperable spatial data infrastructures and capacity building. GSDI and its members represent a wide range of data and service providers, developers, decision makers, users, civil societies and entrepreneurs.

Richard asked if they intend to use OpenSearch in INSPIRE, and Gábor said that yes, the plans include that. Martin asked for status on the Hungarian satellite. Gábor said that it is still operational, and they are working on a second, having secured funds; it will be an enhanced version of the previous.

## USGS

Kristi Kline gave the USGS agency report. She began by discussing Landsat 7, launched in 1999 with an Enhanced Thematic Mapper Plus (ETM+), and eight spectral bands, including a pan and thermal band. It is best known for its on-board data recorder, which changed how and when data could be acquired. It implemented data format control that standardized the format of data at all stations, had a Long-Term Acquisition Plan (LTAP), and an Image Assessment System, resulting in the most consistent and understood Landsat record possible.  This allowed Landsat 7 to be the anchor point for calibrating the entire Landsat 1-7 record. It also contained improvements in technology on-board the spacecraft and ground systems, and improved data accuracy and quicker data access. With it the Pan Band was introduced, and unfortunately had a scan-line corrector problem.

After 15 years, Landsat 7 has collected more imagery than any other Landsat mission. Today, Landsat 7 is collecting more images per day (~440) than it has during any previous period in its 15 year life. The longevity of Landsat 7 ensured that the Landsat record remained unbroken during the period of Landsat 5's end and Landsat 8's beginning. Even with the SLC-off issue, Landsat 7 is still contributing to science and applications.

Landsat 8 was launched Feb. 11, 2013, as is being managed with Landsat 7 as a constellation. It is being used to extend the capabilities-and lifespan-of the Landsat 7. Landsat 7 recently went to a continental landmass acquisition strategy. Capturing images of islands has shifted to Landsat 8. The change helps to conserve the resources of Landsat 7. As a result, more data is being acquired by both satellites. Landsat 7’s output has increased from 375 to 450 scenes per day while at the same time prolonging the life of the ETM+. Landsat 8 is also collecting more than the anticipated 400 scenes per day – currently scheduling 550 images per day. 1000 scenes per day going to the archive, covering 34 million km2 of Earth’s surface.

Landsat-8 has improved surface characterization, a coast aerosol band and improved radiometry benefits water quality studies, and a cirrus band improves cloud detection.

USGS has 39 International Cooperator (IC) Ground Stations in 23 countries. Kristi described the Landsat Global Archive Consolidation (LGAC).

Andy asked how USGS is responding to the Big Earth Data Initiative government mandate. Kristi stated that they have set up “theme managers” to handle this. With Landsat data, they have put things in data.gov at the collection level. The concept is very similar to GCMD, IDN. Andy commented that other agencies are also responding to similar mandates, and this may be an area that WGISS can discuss.

## JAXA

Shinichi Sekioka gave the JAXA agency report. He announced the successful launch of GPM on February 28, with first images released March 27. After 6 months, DPR products will be released. He showed examples of the first images, showing a 3-D cross section of a storm. To promote GPM, JAXA developed a short animation movie. Further, ALOS-2 will be launched May 24.

Shinichi observed that NOAA utilized SHIZUKU (AMSR2) data for typhoon monitoring on February 3, 2014, to monitor a tropical low pressure system in hopes to improve weather forecasting precision.

JAXA contributes to the GEOSS Common Infrastructure and the GEOSS DataCORE.

JAXA changed the data distribution policy for Earth observation satellites in August. Data distribution policy for EO satellites is defined for two categories as follows:

* Data with low or middle resolution, and data with high resolution. In principle, the data with low or middle resolution such as earth environment monitoring satellite data is distributed with “full and open access” policy. JAXA accepts non-discriminatory use and redistribution of those satellite data by users. The implementation guideline for GCOM-W1 data provision was updated in September 2013; redistribution to a third party is no longer prohibited. Commercial use of AMSR-2 data is now allowed without authorization by JAXA, and no royalties are required.
* Data with high resolution: Limited amount of data is provided to the user for the purpose of disaster management and scientific research free of charge; at marginal cost to government users under the cooperative agreement, and to private business at commercial price.

Shinichi displayed a diagram of JAXA’s long term mission plan for EO.

Andy congratulated JAXA on their successful launch. Yonsook said the shift in the data policy is fantastic and WGISS looks forward to more JAXA data available for many applications. Andy agreed, saying that they have started tagging the JAXA data in the IDN. Satoko said JAXA is preparing to provide the data, with significant processing in progress. Richard asked if they have seen a change in the number of downloads since the change of data distribution policy. Satoko said no, since the system is not yet ready for the new policy – this is expected to take at most three years.

## NOAA

Martin Yapur presented the NOAA agency report. He highlighted their satellite operations, which include the geostationary satellites (GOES), the polar-orbiting satellites (POES), the Defense Meteorological Satellite Program (DMSP), and the Jason-2 altimetry satellite with EUMETSAT, NOAA, and CNES. NOAA is acquiring their next-generation satellites, which include the GOES–R Satellite Series, the Joint Polar Satellite System (JPSS), the DSCOVR (Solar Wind Continuity), and the Jason-3 altimetry satellite.

NOAA has 24/7 satellite operations and product processing, providing long term data stewardship. Currently they are consolidating the National Climatic Data Center, National Oceanographic Data Center and National Geophysical Data Center.

GOES-R will have an Advanced Baseline Imager (ABI), Solar Ultraviolet Imager (SUVI), Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS), the Space Environment In-Situ Suite (SEISS), and Magnetometer and Geostationary Lightning Mapper. The Joint Polar Satellite System (JPSS) is operating well, spacecraft and instruments healthy, cal/val progressing well and on schedule. JPSS-1 instruments are now in the environmental testing phase of development, bringing the satellite closer to its planned launch in early 2017. The Advanced Technology Microwave Sounder (ATMS), Cross-track Infrared Sounder (CrIS), Visible Infrared Imaging Radiometer Suite (VIIRS), Ozone Mapping and Profiler Suite (OMPS) and Clouds and Earth’s Radiant Energy System (CERES).

NOAA has established a new office to examine requirements across NOAA, to develop strategies to meet multiple requirements with a single investment, determine the most effective mix of investments in observation and data management systems, and to leverage domestic and international partnerships. He displayed the “Value Tree” for NOAA products, a NOAA and a full government assessment. The results are quite encouraging in providing useful information to decision makers.

Martin described NOAA’s data activities:

* Discoverability - Establishment of NOAA Data Catalog, continued maintenance of subsidiary catalogs at each data center.
* Accessibility - Data Access procedural directive in progress, NWS Integrated Dissemination Program (IDP), Unified Access Framework (improved access to gridded observation and model outputs), and other implementations of standards-based services across NOAA.
* Usability - Metadata training webinars, conversion to ISO metadata standard at NODC, ATRAC metadata editor at NCDC, and metadata metrics and diagnostics at NGDC.
* Preservation - CLASS interface improvements (CSI, M2M), assignment of permanent dataset IDs.

Martin listed recent federal initiatives, and other news for the agency.

Andy asked if the data catalogue will give access at the granule level. Martin said it would be at the dataset level. Richard asked about NOAA participation to BEDI - do the budgets include infrastructure and development – Martin said it includes all. Andy added that NASA is also receiving funds and is in cooperation with NOAA. The climate data toolkit is one in which both agencies are working for opening up the data access. Martin remarked that all the agencies are working in this same direction.

## INPE

Lubia Vinhas gave the INPE agency report. Unfortunately they lost CBERS-3 due to a problem with the launching vehicle. The Brazilian Space Agency confirmed that they will launch CBERS-4 in December 2014, and Amazonia-1 is scheduled to launch in 2016

Lubia described the CDSR data portal, adding that INPE’s data policy continues the same in their data center, with distribution of Terra, CBERS, Landsat, Resourcesat, Terra, and Aqua. This year Brazil had to activate the Charter due to floods.

INPE continues to support the CWIC connector using their PHP interface, and they are beginning development of an OpenSearch interface.

Martin asked about future plans in CEOS participation. Lubia replied that this year they had a workshop presenting to the new director all CEOS activities, and he appointed Hilcea Ferreira to coordinate CEOS activities. She is preparing a plan at his request.

## NSO

Thomas Bleeker gave the NSO agency report. He described the National Satellite Data Portal, which provides Level-1 satellite data of the Netherlands for the period 2012 – 2015. It includes DMC-satellites (MS), Formosat-2/SPOT-6 (MS), Formosat-2/SPOT-6 (PAN), and Radarsat-2 (radar). Preprocessing is necessary. The goal of the portal is to realize efficiency in geo-information infrastructure, speed up application development, and prepare for Sentinels.

NSO’s perspective is to create economic growth and jobs in services industry and in competitive industries using services based on Earth observation by having a free and open data policy, and implementing access to space data in the national geo-spatial data infrastructure.

Thomas gave an example of a satllite applications case unique to the Netherlands: monitoring deformations in dikes (areas, infrastructure, pipelines) using imaging radar techniques from space. Deformation of millimeters is visible, which can be used to predict deformation.

The Netherlands also uses radar satellite data for agricultural purposes, comparing the information provided by the farmers with the actual situation. They are also using it for shellfish monitoring. There is an increasing demand for radar among farmers, construction firms, and oil/gas/salt companies, national and local governments

Andy remarked that this displays great applications for EO products.

## CNES

Richard Moreno gave the CNES agency report. He explained that the THEIA Land Data Centre is a national structure funded jointly by 9 public institutions. Its objectives are to address the needs of the national scientific community in terms of products, methods, and training linked to the observation from space of land surfaces; to facilitate access and use of space data for a large user community; and to make national efforts visible at European and international level. THEIA relies on a Space Data Infrastructure distributed on several sites whose components are developed at CNES, IGN and in the framework of GEOSUD, a network of Scientific Expertise Centres, a programmatic, scientific and technical organisation, and a Web site giving access to THEIA products and services ([www.ptsc.fr](http://www.ptsc.fr/)).

THEIA’s product portfolio includes SPOT Level 1C products (multispectral), Sentinel-2 atmospheric corrections – Level 2A & 3A products, lake and river water level, global vegetation variables already taken up by GIO Global Land, and land cover maps (in preparation). The THEIA portfolio can be seen as supplementary to the Copernicus Services portfolio. The THEIA Space Data Infrastructure (SDI) is seen as a federation of data centres distributed geographically, linked by a nucleus of mutualized services (core components). An SDI can be scaled up with other contributions.

At the national level, THEIA offers a platform to elaborate joint national strategies, such as development of the Spot World Heritage project, the use of Pleiades and Spot 6/7 data, and the use of Sentinel data (in particular Sentinel-2). At the European level, THEIA is an interface of national efforts with European Core Services. This is exemplified in frequent contacts with DLR, and long standing cooperation history with Belgium (VITO, UCL), Austria (U. Wien), and Portugal (IM).

Richard displayed several examples of THEIA products and correction algorithms. He also described CNES’s SPOT World Heritage programme to provide free SPOT satellite archive imagery for non-commercial uses. This was officially announced at the plenary session of the Group on Earth Observations (GEO) in Geneva, on 17 January. The first goal is to process 400,000 multispectral images in four years. A first batch of 100,000 images will be made available at the end of this year. The processing is Level 1C – orthorectified TOA reflectance, with complete coverage of France plus other areas to be defined.

Richard explained that THEIA paves the way for a wide use of remote sensing data by a larger community of users; it stresses the need for a systematic and rigorous validation of the products.

Andy asked if they have solved the ranking algorithm issue. Richard replied that they are in the very early phase of this, and Jérôme added that they have a central catalogue that harvests catalogs from partners. They always return the freshest data, the least cloudy, and user comments; this is achievable because of a centralized catalogue.

## UKSA

Wyn Cudlip gave the UKSA agency report, with a presentation of the Satellite Applications Catapult Centre for supporting application development. The goal is to overcome failure to commercialize and failure to exploit – taking the research and developing useful products, and taking the products and marketing them to get them accepted by the community. The vision is to close the gap between concept and commercialization with a network of world-leading centres, bringing research and business together, accelerating commercialisation, investing in the future of the UK economy and for the long term.

A Catapult Centre is a business-focused technology and innovation centre that makes world-leading technical capability available to businesses to solve their technical challenges. It provides access to world-leading technology and expertise, reaching into the knowledge base for world, and with the capability for collaborative R&D projects with business and contract research for business, and skills development at all levels.

Wyn displayed a diagram of the delivery model (a core grant, working with commercial services and collaborative programmes), and listed the Catapult facilities for collaborative application development. Initial collaborative projects include:

* Synthetic Aperture Radar (SAR) for River Catchment Monitoring
* Monitoring Road and Rail infrastructure using Satellites
* Satellite Mapping of Offshore Wind Resources
* Maritime operations: Situational Awareness, Illegal Fishing

Catapult provides support for knowledge exchange, and for EO data access and exploitation of Synthetic Aperture Radar and Sentinel.

The UK Space Agency’s focus is on policy and strategy; it is a relatively small organisation and does not have its own technical programme but supports UK. It works closely with the Satellite Application Catapult.

Wyn concluded that more higher-resolution satellite data is becoming available at no cost (e.g. Landsat 8; Sentinel missions), but data processing and distribution will remain a challenge.

In response to a question from Satoko, Wyn said that the technology evaluation is being done by Catapult, not UKSA, though UKSA will support it. Richard asked what time period the budget amount listed was for, and Wyn said five years. Andy commented that we are seeing more partnerships with the commercial sector.

# Interest Groups

## International Directory Network

### IDN Report

Michael Morahan gave a report on the activities of the IDN Interest Group.

At WGISS-36 the IDN Interest Group was tasked to investigate a DIF Management Tool. IDN has created a mock-up and started development of such a tool, which they hope to complete by end of year. Satoko asked for a refinement to link users to their links, instead of just the agency DIFs. Michael agreed, but they will need to work with the agencies to make sure the links are assigned to the correct agency.

Michael displayed story boards of the re-design of the IDN website. He explained how the tool can be used to search for datasets and services. He noted that the Visualizations tab allows navigation to the Climate Diagnostics Directory and the Portals tab (to be renamed) links the user to the agency portals and agency datasets and services. There is also page showing a map of the website.

### GCMD/IDN

Thomas Cherry gave a presentation detailing the next release of the GCMD/IDN. New features include metadata mapping table and API, and OpenSearch. The IDN/GCMD is implementing a generic metadata tagging API allowing organizations to apply externally defined "tags" to metadata held in the IDN/GCMD database. These tags are user defined (tied to an account) and are intended to capture metadata details such as collaborations, catalogers, metadata handlers, and researchers. The primary GET interface will return a list of tags and documents or just one document if an entry\_id is supplied. Optionally, additional metadata information can be specified in the "sections" list and these tags will be included in the output XML but by default only the entry\_id tag is returned.

The GCMD OpenSearch implementation has been designed to support both browser integration (via custom search sites in Firefox, for example) and API implementers interested in including IDN/GCMD in distributed searches. In both cases metadata records can be searched using free text and GCMD keywords and API writers calling the OpenSearch interface directly and can include GEO Box coordinates, and temporal values. Results can be viewed in either HTML, Atom, RSS, or CSV (BETA). All OpenSearch query results can also be bounded by GCMD portal subsets (portals; predefined queries forces on one discipline and/or provider contribution). Long result lists are returned in "pages"; 500 results could be viewed in ten 50 page requests.

Access to the IDN/GCMD OpenSearch interface begins with the OpenSearch Description Document (OSDD), a machine readable XML file which describes the capabilities available in the IDN/GCMD implementation of OpenSearch. This document defines how to properly build a query. Amongst all the XML there are a set of links inside of "URL" tags that describe the format of a query. Results are based on the standards for each output type but in all cases entry\_id and URL to more detailed descriptions can be found for records in the IDN/GCMD database.

Yoshiyuki asked if the results include a link to the entire DIF; Thomas said yes, in multiple formats.

### IDN Metrics

Michael Morahan presented IDN metrics. During the last year, total visits were 34672, averaging 88 per day. He displayed IDN usage by country, user access of CSW (average page views per day 3000+), and user access of GCMD services. He showed US GEO DataCORE contributions by agency. He added that the IDN website has a page showing the statistics.

Richard commented that WGISS should discuss the possibility of bringing all the interoperability activities under one umbrella. He and Andy also suggested that for agencies starting from scratch that WGISS recommend OpenSearch as the preferred standard.

## Technology Exploration Interest Group

Andy Mitchell introduced the session, welcoming Satoko Miura as Co-Chair of Technology Exploration Interest Group. He listed the actions from WGISS-36.

Complete:

Action WGISS-36-10: Technology Exploration Interest Group to determine possible session topics for WGISS-37 (one topic may be ISO).

Action WGISS-36-14a: Andy Mitchell to distribute for review the GEOSS Data Quality Guidelines document.

Action WGISS-36-14b: All WGISS to return feedback on the GEOSS Data Quality Guidelines document.

In progress:

Action WGISS-36-15: Andy Mitchell to set up an area on the Technology Exploration web page for listing open source code used by agencies, and announce to WGISS-All.

Andy stated that the main goal of the Technology Exploration Interest Group is to allow a forum for discussion for the agencies. Discussions will include big data and services, cloud computing, semantics, visualizations, authentication, and product format.

### Big Data and Services

#### INPE

Lubia Vinhas gave a presentation on Big Earth observation data analytics for land change monitoring. She stated that INPE’s operational applications for monitoring deforestation in Amazonia include investigations in land use, clear cut, early warning, and degradation. These require intense activities in interpretation, digitalization, and plotting of fifteen years of remote sensing images, deforestation polygons and in a single information system.

Lubia explained that a multi-satellite approach is required to minimize cloud cover, and the data must be analyzed one snapshot at a time. Recent results in the literature show that time series of vegetation indexes can create a detailed classiﬁcation of croplands by detecting important characteristics of land-cover and land-use change. With Web Time Series Services the user gives a certain location to return the time series data.

The MODIS vegetation index archive for Brazil from 2002 to 2014 has 12000 independent ﬁles, and forty years of Earth Observation data is accessible for analysis and modelling. The goal is remote visualization and method development, and big data EO management and analysis. With array databases all data from a sensor can be put together in a single array. With SciDB architecture (shared nothing), large data is broken into chunks, and a distributed server processes data in parallel.

The Land Observatory’s goal is describing change in a connected world. Spatial analysis, time-series analysis, classiﬁcation, clustering, and data mining are performed there. It is a unique repository of knowledge and data about global land change, with 40 years of Landsat and 12 years of MODIS + SENTINELs + CBERS.

Lubia displayed diagrams showing results from initial experiments in extracting the signature for the different land covers.

#### ESA

Mirko Albani gave a presentation of ESA Earth Observation Big Data research and development activities. He explained that key factors in big data are size, diversity, complexity of datasets, and the amount of value that can be derived from innovative analysis techniques applied to diverse and complex datasets. The ESA Earth Observation Directorate has a strong interest in Big Data due to the increasing amount and diversity of EO space data and of non-space data used in conjunction with it. The opportunities are many for science, commercial exploitation, applications, and information technology due to the unprecedented precision and variety of global data. The challenges are many and significant, and require good technical, programmatic and industrial coordination.

Mirko noted a recent ESA EO Big Data Workshop, and listed the ESA EO objectives. Past and present activities include support of the EO community in exploiting EO data and support of researchers and service providers in the development of applications for value added information. Other activities include addressing ICT provisioning, Grid and Cloud computing, IaaS, and complementary GS operations concepts. ESA is providing support to PIs, services and projects, technology pilots and testbeds, standardization, support to eduspace, 3D shows, and is working on the implementation of an ecosystem of five Thematic Exploitation Platforms in the 2014-2016 time frame. A Request for Information (RFI) was issued September 2013 to gauge interest and gather ideas from member states, industry, academia, and user communities and gather information regarding potential themes and corresponding activities to be used as input to the preparation of a formal ESA Invitation to Tender; the response was far beyond expectations.

ESA EO Big Data R&D Lessons Learnt include:

* Cloud ICT provisioning: As soon as ICT needs can be predicted and planned, it was found IaaS more expensive than rental or dedicated hosting solutions. The flexibility of public IaaS less appealing when internal resources are pooled, virtualized and managed as an internal cloud, but IaaS services allow to size down internal ICT resources to the “fixed” need and ensure their maximum utilization; e.g. using external provisioning for the “variable” need hybrid ICT provisioning.
* IPR: Licensing schemes for virtualized/IaaS multi-user often not in place, so must evolve with data and IPR providers.
* Cloud service levels: Terms/conditions in public clouds expressed surprisingly low commitments. Cloud opportunities may become risks when applied to critical systems, so multi-sourcing and  contingency scenarios for services hosted in public clouds is recommended.
* Application areas:  Dissemination and on-demand processing is needed since needs are variable and depending on user demand. Secondary archive and re-processing and temporary resources for integration, testing and demonstration are required because needs are limited in time. System sizing is an important area where remote sensing services can gain from Cloud/IaaS Computing since needs are still unknown.
* User Expectations are that all data are discoverable, accessible online and free, and arranged in long time series of coherent data from different providers. Users also expect to be able to perform processing directly on the cloud using virtual servers, using their preferred cloud provider, that basic/platform software is open and freely available, and applications can be easily ported across clouds. Users also expect open collaboration, and expert support to data exploitation through managed services.

Mirko highlighted that Research and Service Support managed service is crucial to help users in EO data exploitation and must evolve as the user needs evolve. Federated service and infrastructure will require virtual data farm with increased storage and processing. Thematic Exploitation Platforms (TEP) RFI is in the planning horizon of 2014-2016 to implement an ecosystem of five TEPs: Coastal, Forestry, Hydrology, Polar, and Urban TEPs up to end 2016. These will address thematic domains with many possible applications for scientific exploitation of EO data with use cases for full collaborative work environment, based on common components and standards for generic platform capabilities, and open and federated. This plan widens and deepens the scope in ESA Earth Observation Envelope Programme after agreement with ESA Member States.

Mirko listed upcoming events, and agreed to distribute among WGISS the invitation to these when they are announced.

Action WGISS-37-6a: Mirko Albani to send the invitation to WGISS all when he gets the announcement for the “Big Data from Space” meeting. December 2014.

Action WGISS-37-6b: Mirko Albani to send the invitation to WGISS all when he gets the announcement for the ESA-wide conference on Research, Technology and Innovation Associated to Large Amounts of “Space” data meeting. August 2014.

#### NASA

Andy Mitchell described the U. S. Big Earth Data Initiative (BEDI) which seeks to improve the ability to acquire knowledge and discover insights into large and complex collections of digital data. The initiative’s primary objectives are to develop the core technologies needed to collect, archive, manage, analyze, and share large and diverse datasets, and use these technologies to accelerate the pace of discovery and knowledge, and transform teaching and learning paradigms.

The Big Earth Data Initiative (BEDI) invests in standardizing and optimizing the collection, management and delivery of U.S. Government’s civil Earth observation data. BEDI will improve the ability to discover, access and use Earth observations by the broader user community. NASA is to advance these efforts by developing and implementing an agency-wide framework for managing and curating data that will maximize the availability of data and information and ensure dissemination in a timely and usable manner; facilitate the transformation of observations and data into useful information through the use of open, machine readable formats and APIs; encourage the development and use of uniform tools and practices across Feral agencies for the handling of Earth system data and information to increase interoperability; and support the development of information products and tools that directly support decision-making.

Currently only a subset of NASA’s EOSDIS data is available via the Global Imagery Browse Services (GIBS) capability to provide pre-generated full resolution browse imagery. The objective is to greatly expand the number of data sets, as well as the usability of the data, by making it more compatible with commercial GIS software. Additional goals are to enhance the ability to access data via web, enhancing and formalizing standards like GeoTIFF, increasing the ability of commercial search engines to discover EOSDIS datasets, and provide improved support for Open Standards. Lessons learned are:

* Data Acquisition and Archives: choose the best protocol for high bandwidth circuits over long distances; monitor system health, provide system failover, database failover and replication to protect against data loss resulting from system faults; detect data gaps and automatically reacquire missing products; provide users with data gap reports and data archive status; provide data consumers with subscription capabilities and a manifest file to streamline data access.
* User Experience: Data on spinning disk is essential for providing interactive services; quality, consistency and flexibility of metadata services enables service oriented architectures; open source software and standards are vital for interoperability; machine accessible APIs; engage users early and often.

For Sentinel 1, 3, 5P, NASA will leverage proven mirroring and redistribution capabilities, currently used for S-NPP (Suomi National Polar-orbiting Partnership). A single network interface relieves bandwidth load on European networks, and long term archival and end user distribution by DAACs. The network provides metric reports back to the EC/ESA on product distribution and usage, and leverages the entire suite of NASA’s EOSDIS capabilities including capturing and reporting metrics on distribution and usage of Sentinel products by U.S. scientists. The Server System is dedicated to acquiring data from multiple locations, storing data temporarily (~ 30 days), and making data available to six data processing centers. It ingests 6 TB daily, with the capability of distributing 2.5 times the ingest volume, routinely distributing 15TB daily. Products are available to data processing centers within 30 minutes of receipt.

#### ROSCOSMOS

Aleksey Gladkov gave a presentation of the current state and prospects of development of the Roscosmos GeoPortal services.
The Roscosmos GeoPortal is the main geo-information service of Integrated Geographically Distributed Information System of Earth Remote Sensing (IGDIS ERS). Resources available through Roscosmos GeoPortal services are integrated catalogue of IGDIS ERS, with metadata profile based on ISO 19115, ISO 19115-2, and ISO 19139. The GeoData bank of IGDIS ERS data format depends on the type of data – GeoTIFF, Shapefile. The information layers are satellite images and thematic information such meteorological data, fire situation, and public cadastral map.

Aleksey described the ways to access the data from integrated catalogue and GeoData bank. Catalogue data search happens via a web application «Roscosmos GeoPortal» [www.gptl.ru](http://www.gptl.ru/), and a custom catalogue search service. Ordering and receiving GeoData bank data can occur through personal cabinet of Roscosmos GeoPortal, by email, or via FTP or storage media. Third-party vendor services are also available.

Future development of Roscosmos GeoPortal services includes a the new version of Roscosmos GeoPortal web application with conversion from Adobe Flash to JavaScript, an English version of the interface, new functionality to search, browse and order data, and improved usability. Web services development includes significant internal optimization of WMS services in according to the increasing data volume and number of users, ability to browse the overview pictures of ERS products available in the GeoData bank before ordering, and ability to retrieve ordered data via private WMS services.

The integrated catalogue access development will consider a custom RESTful interface, a CSW interface, and/or an OpenSearch interface. The metadata is currently in Russian. Plans for processing include introduction of processing complexes to IGDIS ERS, and providing WPS interfaces. Ideas for ordering are a RESTful interface, and OGC 06-141 (OSEO, Ordering Services Framework for Earth Observation Products).

Alexey demonstrated the GeoPortal browse capability, filtering, and ordering capability. The information layer is available via WMS services, and he confirmed that an English version is planned. Regarding the data policy, the information layer is freely available for non-commercial use, and in the near future there is open data conception. Roscosmos is going to open data to resolution of 15 meters.

#### NASU/SSAU

Nataliia Kussul discussed the JECAM and GEOGLAM activities of SSAU, and the big data challenge involved. JECAM has three test sites in Ukraine for crop measurement and mapping. Crop mapping includes crop mixture (winter, spring, and summer), important minor crops, and uneven crop proportions distribution. There is large territory so this is a big data problem. The data used is SPOT4, RapidEye, RADARSAT2, and Landsat -8; ground data (June) is also used.

Preprocessing for classification includes conversion to top-of-atmosphere (TOA) reflectance, atmospheric corrections (from TOA to surface reflectance) using the SMAC model, cloud and shadow identification, and filling in missing data due to cloud and shadow areas (restoration). A crop map for Kyiv oblast (2013), showed overall accuracy of 86%.

The validation of global products for the JECAM test sites in Ukraine are within FP7 ImagineS, follows ESA VALERI protocol (30 ESU – elementary sampling units), and compliant with CEOS Land Product Validation (LPV) guidelines using CAN-EYE software. Biophysical parameters are LAI, FAPAR, and FCover.

Future plans include winter and summer crop maps (PROBA-V, MODIS, Sentinel-1 and Landsat-7, 8, Sentinel-2, 3 oblasts-NUTS2 validated, whole Ukraine – provisional). More research in 2014 is planned on the assessment of integration of SAR and optical images for crop mapping in Ukraine. Special attention will be paid to sequential crop mapping, i.e. producing crops as satellite images become available.

### Cloud Computing

#### CNES

Jérôme Gasperi gave a presentation on quality assessment and land cover services in a collaborative cloud environment, a result of the CNES/Astrium joint initiative within the «Open Mobility» thread - Cloud Computing of the OGC OWS-10 Testbed. This features orthorectification of raw image, quality assessment of the orthorectified image in terms of geometrical accuracy, and computation of land cover map from an orthorectified image.

Key points are client base processing chain workflow between multiple clouds, collaborative processing without raw data acquisition transfer between clouds, WPS based on demand processing, and integration of Orfeo Toolbox library within Constellation SDI. The participants are Airbus Defense and Space, Orfeo Toolbox, Constellation SDI, and mapshup. Jérôme displayed the architecture as follows:

* Search catalogue; Orthorectify raw image stored on a Terradue infrastructure using a reference database and processing chain located at Airbus Defense and Space infrastructure without moving the data.
* Ask for orthorectification.
* Compute AOIs, RPCs.
* Apply RPCs to generate orthoimage.
* Stream orthoimage WMS layer.
* Assess orthoimage quality. Assess quality of the orthorectified image stored on Terradue infrastructure using a reference database and processing chain located at Airbus Defense and Space infrastructure without moving the data.
* Compute AOIs, compute errors.
* Stream error shift WMS layer.
* Compute Land Cover from orthorectified image stored on Terradue infrastructure using CNES OTB processing executed on Geomatys infrastructure.
* Stream land cover map WMS layer.

### Semantics

#### NASA

Karen Moe gave a presentation on semantics from a NASA perspective. She noted that semantic technology development includes Semantic Web for Earth and Environmental Terminology (SWEET), Semantically Enabled Scientific Data Integration (SESDI), and community efforts on semantic web. The goal is to proceed from terminology to taxonomy to ontology and finally to tools for discovery and use of satellite-derived knowledge.

Karen explained that SWEET is a concept space to enable scalable classification of Earth system science concepts so that anyone can import, expand and specialize the work of others, with no need to regenerate a physics, chemistry, or math ontology. The concept space is translatable into other languages/cultures using ‘same as’ notions. SWEET was initially created to capture relationships between GCMD keywords, with controlled keywords represented as a taxonomy. The data provider may submit additional uncontrolled keywords within their metadata records. SWEET is an upper-level ontology with common definitions for terms use in multiple disciplines, common language in support of community and multidisciplinary activities, common ‘properties’ (relations) for tool developers with the purpose to reduce burden on creators of specialized domain ontologies.

Karen displayed a diagram of the SESDI methodology, and listed Earth Science Data System projects using semantic web.

Next steps in the area of semantics are to include information content to support CEOS disasters pilots. A proposal is in place for collaboration between WGISS and the ESIP Federation to develop methodology to identify key terms in disaster domains (terminology, classification, relationships).

Richard asked if they use linked data; Karen said that they do.

#### CNES

Jérôme Gasperi gave a presentation on semantic search from the CNES perspective. He explained that semantic search helps users find the right data. To add semantic capabilities to EO product search services one must characterize products with relevant information. Think “users”, not “experts”, decode natural language queries, and use footprint to enrich metadata from exogenous data. ITag allows tagging a footprint with continent, country and land use.

RESTo provides semantic search capabilities using a query analyzer to translate a query into a set of EO OpenSearch parameters. A query string analysis algorithm is based on simple recognition of words and patterns to decode the queries. Words are stored within a dictionary.

Jérôme showed an example and outlined some issues with the keywords approach, specifically multiple and ambiguous meanings to the same word. He concluded that linked data is the right way to do Semantic Web, and noted that the update RESTo jSON model is to follow jSON-LD format.

Andy asked if other agencies are looking at linked data for semantic search. Richard gave an example of a test they ran using linked data, and said it would be interesting to make a summary of the output of the presentation Technology Exploration presentations.

### Visualization

#### HUNAGI

Gábor Remetey gave a presentation on the NASA World Wind (WW) Virtual Globe Technology and the WW Europa Challenge. He explained that the relevance of NASA WW in the WGISS context is that it is aligned with the interest of the EO data community and service providers, widening the EO user community, especially students and young professionals, empowering SMEs to use EO data not only as consumer but supplier, and offering Open Source applications and facilitating Open Data to be widely accessible even in the mobile device environment.

Virtual globe technology is enabling applications development via an open source platform with emphasis on interactive data analysis. NASA WW is ready to use; it includes Digital Terrain Model (SRTM30Plus for bathymetry,30” arc-sec ~900m, SRTM3 v2 v4.1, 3 arc-sec, ~90m, ASTER ~30m, and USGS NED, ~30m). It also includes imagery of BlueMarble, Earth’s 12 Seasons (500m), Landsat (15m), and MS Virtual Earth Aerial Imagery (1m).

Freedom to develop any functionality makes World Wind suitable for any application. It allows full control over the quality and accuracy of both the spatial data and terrain, and supports OGC compliant WMS servers for access to spatial data to place anywhere on the globe surface. World Wind facilitates innovation and competitiveness, and provides the virtual globe for any geospatial data. Besides imagery and elevation data, it is possible to locate any spatial data on the globe.

The Europa Challenge 2014 provides a university project, and a professional SME project for small businesses. A few topics include:

* Advanced Graphical three dimensional visualization of INSPIRE compliant Atmospheric conditions both static and dynamic over time. From simple spatial forms (isolines, grids, etc.) to live effects visualization.
* Procedural Object rendering from INSPIRE compliant imageries (i.e. WMS layers): visualization of three dimensional objects over specific areas of the terrain, based on an analysis of image data and geometries taken from remote image datasets: e.g. trees on forest area, ships on the seas, buildings on residential/commercial/industrial areas.
* Interactive visualization of INSPIRE natural risk zones, like areas prone to flooding, earthquake, eruptions, landslides and avalanches with graphical and mathematical simulations of these phenomena.
* Interactive visualization of INSPIRE compliant urban furniture such as water underground pipelines with detail visualization and editing.
* Advanced fire spread simulation based on INSPIRE compliant digital earth elevation models, terrain type and weather conditions.

Gábor concluded saying that World Wind, as an open infrastructure, enhances competition, increases innovation, and accelerates development of IT solutions. World Wind 3D visualization technology gives any application the means to express, manipulate and analyze data in a virtual representation of the real world. World Wind provides unlimited opportunity for entrepreneurial solutions that serve unlimited spatial information management needs for any desired functionality. By contrast, Google offers an application with pre-determined functionality.

Richard asked if COVE is based on World Wind; Andy replied that it is not. Satoko asked if he had any information on the JAXA involvement, and Gábor said he would send her the references.

#### NASA

Matt Cechini gave a presentation of Global Imagery Browse Services (GIBS) and of Worldview. The vision of GIBS is to advance near real-time and science user interactions with EOSDIS’ inter-disciplinary data through enhanced visual representation and discovery. The goals are to provide full resolution browse imagery (parameter visualizations) for all NASA EOSDIS data products, and to provide centralized, scalable, high performing, highly available and community standards based imagery services. GIBS service offerings are standardized tiled access via OGC WMTS / TWMS / KML and simple integration into existing mapping/GIS applications and libraries. GIBS imagery products are available from May 2012 -> Present, within ~4 hours of observation and with ~80 unique visualized parameters. The full archive is preparing for MODIS collection reprocessing, AMSR Full Mission Reprocessing (2002 -> Present), and AMSR/SSMI Freeze/Thaw (1979 -> 2010). Open Source software includes OnEarth Image Access Software (GitHub), and MRF Imagery Storage Format (GitHub).

NASA Worldview is the reference client for GIBS. It is browser-based, developed using open standards (JavaScript, CSS, HTML) for cross-device compatibility, and is currently tailored toward near-real time data community. It includes support for polar stereographic viewing and downloading of full-resolution imagery, and supports data granule discovery. It is opensource.

Matt gave a demonstration of Worldview.

Yoshi asked how much of GIBS’ client is opensource. Matt replied that Worldview is open source, and all the software that facilitates distribution and access is opensource. All other software will be opensource by the end of the year. The links to the GIBS open source project will be posted in the next week. Richard asked if they are pre-tagging all images. Matt replied that they are pre-caching the tiles, and this is a large increase so the big data will need to be handled. The imagery is composited, and they are able to leverage a metadata service to query.

Jérôme asked what projection the layers are in. Matt replied that currently they are in web Mercator, and they are looking to pull in the OpenStreet maps.

### Authentication

#### ESA

Andrea Baldi gave a presentation on ESA EO Identity Management Functions. He noted that ESA is supporting identity management using authentication, user registration, password recovery, secure storage, user’s administration, security enforcement, and auditing, reporting, authentication for java applications, easy deployment and IT redundancy. He explained some of the identity management evolution.

Internally (ESA EO Federation) they use attribute authority FIM management, and have a short term plan for inter-federation, and a mid/long term plan for space identity management federation. ESA EO scenarios for identity federation include ESA EO Internal Federation, ESA EO Mirror Sites, cooperative scenario amongst federation partners, and accepting Social Network Users (e.g. OpenID).

Federation is important because it is a Key enabler for Federating user communities belonging to different organizations to easily share EO data/services by allowing cross authentication and authorization. The organizations accept users authenticated by federation members; the authorization policy is deﬁned by the organizations owning the data, and the authorization process is implemented and managed by the organizations supplying the data/services. Andrea displayed a diagram of Federation context, showing additional bilateral and multilateral agreements.

In the cooperative scenario, organizations provide their own data and services to any federation members. Data Policy Agreements are established within the federation and implemented via authorisation. Users registered with any federated organisation can access data of any other federated member if authorized, and users always authenticate via their own organization. Access reporting is available to Federation members, and each Federated organization manages its own AAIs Infrastructure, user relationships, and user registries.

Federated Identity Management for Research Collaboration (ESA-FIM4R) addresses the challenge of scientiﬁc laboratories and research organizations of making huge amounts of data accessible by expanding user bases in dynamic collaborations that cross organizational and national boundaries. Objectives were listed. Space identity management federation context, and inter-federation context were described.

In conclusion, Andrea stated that Federated Identity Management technology creates opportunities providing technical solutions for cooperative scenarios, enabling organizations to increase data distribution via a simpliﬁed user access, and increasing data exchange and collaboration with international partners. The technology is mature for building a Space IM Federation.

Next step is a kick-off FIM internal project for building the baseline for Identity Management Federation to design and implementation building blocks for FIM, to establish Internal ESA EO Federation, and to build capabilities to join existing federations.

Andy complimented him on his detailed presentation and expressed interest to discuss the Copernicus having federation with NASA for the Sentinel data. Yonsook commented on the complexity, which is the current reality. She asked, if each federation authenticates its own users, who does the authorization? Andrea replied that each organization does, assuring that their data policy is implemented. Richard asked if there is a sense to make compliance at the larger level. Andy did not think WGISS should start a project, but rather be aware what the agencies are doing.

Andrea said he would keep WGISS posted on advances.

#### NASA

Brett McLaughlin gave a presentation on User Registration System (URS) onboarding and migration. He explained that URS is about identity across the organization, standardization, uniformity, and metrics, using widely accepted protocols, and having redundancy and failover environments. He displayed a diagram of the logical architecture, and listed current application clients.

URS 4.0 is the fourth generation of the API. With it, the individual application never sees the users’ credentials. All information is supplied to URS only. He displayed the authentication workflow diagram, where the user visits partner website (and a protected resource) via their web browser, the partner website redirects user to URS, the user logs in via URS, and URS sends a code to the user’s web browser, redirecting the user back to the partner website. The partner website uses the user’s code to get a token for access via URS.

### Product Formats

#### ISO TC 211

Liping Di gave a report on ISO TC 211 Standard Development Activities Related to Earth Observations. ISO Technical Committee 211 (TC 211) is responsible for setting international standards on geographic information/geometics. ISO TC 211 has set up liaison relationship with many related external organizations, including CEOS WGISS. The scope of ISO TC 211is standardization in the field of digital geographic information. TC 211 aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth. These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations. The work of TC 211 shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data.

Liping listed the ISO TC 211 organization, and the various working groups. The ISO metadata standards include:

* ISO 19115:2003- geographic information-metadata, published in 2003, is the base standard for geospatial metadata and developed from FGDC metadata standard.
* ISO 19115-2:2009 - Metadata - Part 2: Extensions for imagery and gridded data, published in 2009, provided additional metadata element and structure for remote sensing imagery and derived grid products. It is based on FGDC remote sensing metadata standard.
* ISO 19115-1:2014 – Geographic Information-Metadata-Part 1: Fundamentals, published in 2014. A revision of ISO 19115:2003, much improvement over 2003 version in many areas, especially in the description of contents in multi-dimensional data. The data quality part has been moved to ISO 19157. It is a replacement of ISO 19115:2003. No direct back compatibility with ISO 19115:2003 but can be mapped from ISO 19115:2003 to ISO 19115-1:2014.
* ISO 19157:2013 – Geographic Information – Data Quality, combined all data quality related metadata standards in ISO TC 211. ISO 19113 --quality principles, ISO 19114 –quality evaluation procedures, and ISO 19138 –data quality measures. The quality description part of ISO 19115. The content defines components for describing data quality, specifies components and content structure of a register for data quality measures, describes general procedures for evaluating the quality of geographic data, and establishes principles for reporting data quality.

XML schema standards for ISO metadata are:

* ISO/TS 19139:2007: XML schema for ISO 19115:2003
* ISO/TS 19139-1:2012: XML schema for ISO 19115-2:2009

On-going and near future work on metadata

* ISO/TS 19115-3 (on going); XML schema for ISO 19115:2014
* ISO/TS 19157-2 (near future project); XML schema for ISO 19157:2013, To be started in this year
* Revision of ISO 19115-2 (near future project); To be started in next year; CEOS WGISS can play a significant role on the revision.

Remote Sensing Imagery Standards (published standards/specifications):

* ISO 19101-2:2008 Geographic information - Reference model - Part 2: Imagery
* ISO/TS 19129:2009 Geographic information - Imagery, gridded and coverage data framework
* ISO/TS 19130:2010 Geographic information - Imagery sensor models for geopositioning
* ISO/TS 19130-2:2014 Geographic information -- Imagery sensor models for geopositioning -- Part 2: SAR, InSAR, Lidar and sonar

On-going imagery standard projects:

* ISO 19159-1 Geographic information - Calibration and validation of remote sensing imagery sensors - Part 1: Optical sensors; to be published as TS in 2014
* ISO 19159-2 Geographic information - Calibration and validation of remote sensing imagery sensors -- Part 2: Lidar; project started in November 2013
* ISO 19163 Geographic information - Content components and encoding rules for imagery and gridded data

Near Future imagery standard projects:

* Remote Sensing Data Archiving Standard

ISO 19163 - Content components and encoding rules for imagery and gridded data:

* Define a data content model for each kind of remote sensing data
* Define the rules for encoding the contents into a data file
* Provide example of encoding the contents into commonly used formats (NetCDF, GeoTIFF, HDF, HDF-EOS, GMLCov, JPG2000)

Liping concluded saying that CEOS members are important users of ISO standards. The inputs from CEOS are very important to ISO TC 211 standard development. CEOS members can submit comments and inputs to the ISO standard project through the CEOS WGISS liaisons to ISO TC 211 (Dr. Wyn Cudlip, Mr. Lorant Czaran), or its national body to ISO TC 211. CEOS WGISS can propose and lead an ISO TC 211 standard project.

Yonsook asked if there are any capabilities to map in the ISO 11915 from one language to another. Yonsook will send an email detailing this question.

**Action WGISS-37-7: Andy Mitchell to summarize the WGISS-37 sessions on big data, cloud computing, semantics.**

## Data Stewardship Interest Group

### Introduction

Mirko Albani introduced the Data Stewardship Interest Group (DSIG), whose purpose in WGISS is EO data stewardship guidance. The group’s goals are sharing of agency investigations, developments, and lessons-learned relating to EO data stewardship, sharing experiences and lessons learned, drafting common cross-agency best practices or guidelines of data stewardship for possible adoption by WGISS, and sponsoring technical exchanges at WGISS meetings or elsewhere. The group’s efforts are focused on long-term archive strategies, data formats, data preservation, data lifecycle concepts, and archive media.

The DSIG has produced white papers, reports, and best practices/recommendations:

* Long-Term Archive Strategies
* Data Preservation Techniques
* Data Lifecycle Models and Concepts
* Browse Survey 1997-2010
* Guidelines for GIS-Ready Products
* Browse Guidelines Document (version 2)
* Offline Media Trade Study
* European Long Term Preservation of Earth Observation Space Data
* Preview Image Principle
* Data Management Statement

Possible future activities include sharing information and experiences about agency investigations, developments, studies, and lessons-learned relating to EO data stewardship, and periodic report from CEOS agencies during WGISS meetings. Other future activities may be to draft common cross-agency best practices or guidelines on data stewardship for possible adoption by WGISS on preservation workflow and guidelines, preserved dataset content, E2E Level-0 data consolidation, archived data media transcription, persistent identifiers, purge alert procedure, and appraisal procedure. The group also proposes a CEOS DSIG best-practices/guidelines for adoption in GEO and as input to standardization activities (e.g. OGC/CCSDS).

In the short term, the group suggests extending the DSIG membership through invitation email to WGISS-all with DSIG plan of activities and requests for level of interest. They also hope to set up DSIG reporting by CEOS interested agencies from next WGISS, and initial focus on best-practices/recommendations for preservation workflow, persistent identifiers, and updating the CEOS Purge Alert mailing list. They would also like to contribute to “GEO Data Management Principles Task Force (DMP TF)” activities which will support GEO in the definition and endorsement of common GEOSS Data Management Principles covering the entire data life cycle from planning, to acquisition, quality assurance, documentation, access, archiving and preservation.

Wyn noted that it is important to have good access to the documents, and in fact they are available on the website. Satoko recommended that they provide input to the GEO workplan as the WGISS contribution to GEO. Andy suggested asking which agencies also wish to support this, and Mirko commented that he will represent ESA, and Andy agreed to find out if NASA also plans to participate. Michael noted that John Faundeen created entries in the IDN for the documentation generated by the DSIG.

**Action WGISS-37-8: Mirko Albani to prepare a plan of activities for the Data Stewardship Interest Group to present to WGISS and determine level of interest and participation.**

**Action WGISS-37-9: Data Stewardship Interest Group to provide input to the GEO workplan for the WGISS contribution to GEO.**

**Action WGISS-37-10: Mirko Albani to update the purge alert distribution list.**

### Long Term Data Preservation

Mirko Albani gave a presentation on long term data preservation LTDP activities at ESA and in Europe. The main drivers at ESA are to preserve any mission acquired data and associated knowledge as humankind asset safeguarding the investment and effort in space R&D and operational data acquisition. The assumption/awareness is that one can never anticipate the exploitation value of the data asset in the future. Preservation is to be addressed in all EO mission phases with an incremental approach for past/current missions, systematic planning/approach for future ones. They will ensure full content of the ESA archives is fit for contemporary purpose and maintained accessible and usable in the long term, and valorize the data assets for current/future exploitation through building long time series of coherent data (harmonized formats and metadata) and data collections for specific applications (e.g. Fundamental Climate Data Records), and pursue multi-disciplinary data use and “cross-fertilization”. The ultimate goal is to optimize investments in future missions GS Dev and Ops, anticipating LTDP requirements and operational scenarios.

ESA LTDP Programme Activities for EO are in the areas of coordination and international cooperation, EO historical mission datasets consolidation, access, preservation and curation, and LTDP specific developments and evolutions. Mirko displayed a diagram of the international context – with a dedicated group for European LTDP. Mirko listed their core documents, and EO international coordination and cooperation activities, and time data series holdings.

ESA EO Data Preservation scenario implementation for historical missions involves:

* Assessment of archived data and information holdings versus “PDSC” on-going for all ESA and ESA managed TPMs starting from historical ones and ERS-1/2.
* Consolidation of Level-0 datasets (and associated information), and generation of two copies to be stored in two different locations; ingestion in robotic tape libraries in the format of standard Submission Information Packages (SIPs); data migration to latest available archive technology.
* Ensure basic discoverability via ESA catalogues, products generation through the currently available processors and dissemination through ESA standard systems; reprocessing when feasible for alignment to future missions with particular focus on Climate Change Initiative requirements and needs.
* Progressive historical archives rationalization.
* Lessons learned used to update the Preservation Scenario.

### EO Dataset Preservation Workflow

Mirko Albani gave a presentation on EO Dataset Preservation Workflow. He explained that preserved datasets consist of data records, processing software, and representation information. The Preserved Data Set Content (PDSC) document describes in detail the content of a “Preserved Dataset”. E2E consolidation aims at the generation of single, consistent, consolidated and validated “Data Records” and is tailored for each Mission/Sensor according to its specific preservation/curation requirements; it consists of all the activities needed for data collection, cleaning/pre-processing, completeness analysis, and processing/re-processing. Preservation aims at the creation of a single, consistent, consolidated and validated “Preserved Dataset” and at ensuring its long term integrity, discovery, accessibility and usability. It is focused on an individual or on a multi-mission Dataset and tailored according to its specific preservation/curation requirements. It consists of all activities needed to ensure “Preserved Dataset” integrity over time and to optimize its (re)use in the long term. Value adding aims at establishing and increasing the value of “Preserved Datasets” over their lifecycle, at favoring their exploitation also through the combination with other Data Records, and at extending their user base. It includes, among others, activities like primitive features extraction, exploitation improvement, data mining, coordination and management of Data Time Series and Collections (e.g. from similar sensor family) in support to specific applications and in cooperation with international partners. It might lead to an update of the preservation/curation requirements.

The Preservation Workflow defines a recommended set of actions/steps to be implemented for the preservation of a “Dataset” with the objective to ensure and optimize its (re)use in the long term. The set of actions/steps need to be tailored for each specific mission according to its specific preservation/curation requirements. It can be applied to historical, current and future missions. The result of the Preservation Workflow application consists of preserved datasets discoverable and accessible to users and for any additional curation/valorization activity, and a set of documents describing the selected preservation strategy and implementation plans and activities for each individual mission dataset.

Mirko listed the preservation workflow steps and flowchart, detailing initialization, consolidation, implementation/operations. This is in line with the standards. He also displayed a diagram of a lifecycle model for dataset curation and preservation. He detailed a workflow procedure for historical missions, adding that future missions should plan long term preservation from the beginning. Current missions should try to apply the requirements of initialization and tailored LTDP procedures.

Wyn commented that sometimes there is a change in ownership and this needs to be included in the process, and to be captured in the GCMD. Kristi commented that this happened several times with Landsat, and it is really important. Every station that collected the data had a different format. One of the issues with going back to the early missions is trying to maintain the data in a state that is usable – one of the biggest challenges is to make the data useful all the way back to the beginning.

### Persistent Identifiers

Mirko Albani introduced the Persistent Identifiers session. The generic need for PIs is interoperability, knowledge, data retrieval, preservation, resource discovery, and unsuitable URLs. Objectives are to assess if and how persistent identifiers can be introduced in Earth Sciences and to Earth Observation mission data, and to provide a globally unique, unambiguous, and permanent identification of a digital object for locating and accessing it for a long time. The present needs are to improve discoverability and accessibility, to enable users to retrieve objects without knowing their location, to enable repositories to change the location of objects internally, to enable repositories to share objects with other services where appropriate, and to enable researchers to cite objects consistently over time.

Persistent identifiers are simply identifiers that allow reference to a digital object, location independent. A Persistent Identifier is an identifier that is effectively and permanently assigned to an object. PI system requirements include global uniqueness, persistence, resolvability, reliability, authority, flexibility, and interoperability. The benefits for data holders are increased data visibility and data use, and credibility / value of agency data holdings.

Almost all PI systems use a Resolver to retrieve the physical location. The responsibility for PIs is shared between the system provider, and the data holder. Mirko displayed a diagram of possible network of relations of PIs in EO, and listed a few challenges and considerations, such as interoperability, long term commitment, access to the resource must be maintained, resource may move, be renamed, be removed, or updated. In EO, decisions must be made regarding which digital object to assign PIDs – granularity, processing level, etc.

Mirko gave examples of PI systems: ARK, DOI, LSID, PURL, URI, EPIC, IGSN, and nbn-urn. He made several observations: A lack of a standard and globally recognized solution; DOIs fulfill most criteria and seem to be the preferred PID system used in Earth Sciences and Earth observation; DOI is free of charge for any research group that has more than 50% government funding - at least if requested through Technical Information Library (TIB), Hannover, Germany; ARK solution is free;  Harmonized guidelines for PID implementation - hierarchy, granularity, versioning, etc. - are more important than using a common PID system.

The LTDP working group activities on PIDs include Preliminary Analysis of Persistent Identifiers (already done), and comparative analysis of existing PIDs (DOI is preferred). Yet to be done is a definition of approach and concept for use of PIDs in EO, a trade-off and cost/benefit analysis of implementation for the different solutions in EO, a proof of concept / pilot implementation, and recommendations. Mirko commented that he would like to share this work with WGISS, specifically the DSIG.

Technical approaches for harmonization are to use the same PID in all agencies, or develop PIDs translators between different PIDs systems. Harmonized Best Practice for PID implementation (hierarchy, granularity, versioning, etc.), with implementation left to each agency/organization.

Richard asked if the study would be finished in time for WGISS-38. Mirko said probably not, but advances can be shared. Aleksey asked what they use at ESA. Mirko said that currently they use a URL, but this is not the best approach.

#### NASA DOI

Nate James gave a presentation on Digital Object Identifiers (DOI) for NASA Earth science data. He explained that a DOI is a unique identifier that can be embedded in a permanent URL, which resolves to a web page that describes a data product and credits the product creator/steward for their work. A DOI string is a unique alphanumeric that consists of a prefix and a suffix, and the DOI URL resolves to a web page that describes the cited object. It is string used as an identifier for citing digital objects in literature. Once registered, the DOI never changes. The URL link resolves to actively maintained web page with additional information. It uses “Smart” Landing Pages digitally tagged to enhance search and discovery, supports reproducibility and integrity of scientific results, and encourages citations by crediting data creators and stewards. Nate showed an example of a NASA-ESDIS DOI.

The NASA-ESDIS goal is to assign and register DOI’s for all datasets managed by EOSDIS. To accomplish this their role is to develop guidelines, procedures and processes for registration of DOIs, quality check the DOI metadata, reserve DOIs with ESDIS, register DOIs with EZID, update information with EZID, and maintain DOI records (via wiki). He listed the mandatory metadata, and non-mandatory additional information, and explained the registration process.

Community input is sought for DOI format (structured vs opaque), self-registration by DAACs requesting to auto-generated DOIs, and landing page guidelines. ESDIS drivers are automation and CMR-compatible DOI processing. Nate displayed a diagram of the future ESDIS DOI system, and compared it to the current system.

Mirko asked why they do not use the DOI foundation. Nate replied that they need to form their own names (prefix) to be able to search and identify citations of EOSDIS data products usage.  Jérôme asked how they manage the update of the redirection to the landing page. Nate replied that the URL is a metadata element in the DOI and can be updated as the URL changes.  Aleksey asked about data that is located in two different places - do they point to two different URLs.  Nate replied that the data providers do not have to do so and can provide information about the data availability at different locations on the landing page. ESDIS is working to resolve this and other related issues in the development of guidelines for DOI landing pages.

#### CNES ARK

Danièle Boucon gave a presentation on ARK (Archival Resource Key) for REFLECS, CNES discovery tool. Study and advice was received from BnF French National Library in particular, implemented in 2011 for REFLECS resources (REFerence catalogue of Long term CNES Scientific data). It automatically generated at the required catalogue level from the mission CNES inventory: mission, collection, dataset, with minimal implementation for internal use at a first step. She described the insertion of the ARK ID in the URL. The global inventory mission by mission contains data, documents, software in a REFLECS catalogue metadata.

Danièle gave an example of a link with the IDN. As a first step, ARK requires minimal implementation for internal use, but more work is needed to identify all types of information: granularity, links between data objects and metadata (qualifier), and impacts on archival systems and resources management. Strategic decisions are required. Interoperability with other PI systems also needs to be considered.

# WGISS Projects

## CEOS OpenSearch Project

Yoshiyuki Kudo introduced the CEOS OpenSearch Project session with a brief history and status of the project. The project began in May 2013 with the question of how to achieve interoperability between CWIC and FedEO (SIT meeting, 2012). The solution is an OpenSearch interface on both. OpenSearch is a simple specification with low-hurdle for implementation, and adoption in OGC Catalog Service. The project objective is to establish a common CEOS interoperability best practice of OpenSearch in order to allow for standardized and harmonized access to metadata and data of CEOS agencies, including CWIC and FedEO communities. Yoshiyuki listed the project team members.

Yoshiyuki explained that OpenSearch is a collection of simple formats for the sharing of search results. It is described in the OpenSearch description document (OSDD). The response is in syndication formats (e.g. Atom, RSS, etc.), and it uses complementary parameters/ elements. The query parameter includes searchTerms, count, startIndex, startPage, and the results element includes totalResults, startIndex, and itemsPerPage.

### CEOS OpenSearch Best Practice

Yoshiyuki Kudo described the CEOS OpenSearch Best Practice, which covers four topics:

* CEOS OpenSearch Best Practice. Should be compliant with OGC OpenSearch specification (OpenSearch Geo and Time Extensions [10-032], OpenSearch EO Extension [13-026]). Best Practice is not a specification , but defines implementation requirements where necessary, and is for the users benefit, and maintains simplicity.
* Comments submission to OGC: Coordination with OGC; review and provide comments on OGC specs by CEOS project members. Comments not fit OGC specification are incorporated into CEOS OpenSearch Best Practice. 39 comments collected, Submitted to OGC. Directly to the author (34 comments), In public comment period (5 comments).
* Introduction to CEOS OpenSearch Best Practice (draft). Document Status is Draft stage. The document outline was described, with chapters on Common Best Practices, and a Closer Look on Implementations (CWIC, FedEO, CNES, etc.)
* Common best practices to date
* 2-step search: Satellite data granularity / hierarchy. First step: Dataset level search; second step: Granule level search.
* Search Query: Common rules include multiple words in {searchTerms}; Specify in OSDD by Parameter Extension, or Fixed rule (when not supported in the parameter extension). Recommended list of query parameters (incl. combination).
* Search Result: Common rules (applicable to Atom response) include use atom:link@rel=“alternate” for detailed metadata, use GeoRSS Simple for Geographical area, browse in Atom: either is OK.
* Discovery from Search Engines: Case 1 (Keywords, Discovery of portals, Make search in the portal, Discovery of satellite data). Case 2 (Keywords, Discovery of satellite data).

Remaining topics include:

* Best Practices on list of search parameters and Atom response elements, exceptions, ranking (server side and client side)
* Implementation specific practice (CWIC, FedEO)
* “Compliance” test suite
* Reference client

The team is planning to have a CEOS OpenSearch Workshop at WGISS-38 with the purpose is to educate Client implementers (How to access and make better use of CEOS catalogs using OpenSearch), and server implementers (How to implement an OpenSearch server aligning with Best Practice to expose agencies’ satellite data catalogue). Possible agenda items include a walk-through of the best practice document, demonstrations, and code sharing. The team also plans continued support prepared in CEOS OpenSearch web page, and plans to do refinement towards v1.0 in October/November timeframe of the CEOS OpenSearch Best Practice document.

Richard asked about the OpenSearch extension document. Yoshiyuki said that it will be presented at the OGC meeting in June, and the comments phase will begin at that time.

### Implementations - CNES

Jérôme Gasperi gave a presentation of the OpenSearch implementation at CNES. He listed OpenSearch enabled data sources, and explained that the OpenSearch capabilities are provided by RESTo (restful semantic search tool for geospatial), which is an implementation of OGC 13-026 OpenSearch Extension for EO. He showed a diagram of the architecture, and described the three characteristics of RESTo: restful, responsive, and reliable. Jérôme noted that it can be used on any kind of device and gave statistics of how quick the response can be. During the ingestion process, resources are automatically tagged with location and land use. Additionally, conditional ingestion rules can be defined at the collection level to provide specific tags.

RESTo provides semantic search capabilities. It uses a Query Analyzer to translate natural language query into a set of EO OpenSearch parameters. Jérôme gave examples of searches on SPOT collection and Charter collection data. He noted that one can directly access the OpenSearch description, and also define user access to tag data to limit the data returned. The Query Analyzer can be used as a service itself.

Doug asked if the website is available – Jérôme said it is, and the links were provided.

### Implementations - IDN, CWIC, ECHO

Archie Warnock gave a presentation of the OpenSearch implementation for IDN, CWIC, and ECHO. He stated that to achieve the discovery and access goals they will leverage the OpenSearch standard, the IDN dataset metadata repository, and the CWIC granule access, exploit the 2-step discovery process via IDN and CWIC, and develop a sound methodology that can be reused by other Earth Data OpenSearch implementations. He listed the CWIC best practices.

Archie showed visualizations of how it works: Search the IDN to retrieve an OSDD – retrieve a set of responses in an atom feed. The search link sends an HTTP get request and the CWIC HTTP response is returned. He described the OpenSearch Descriptor Document, The HTTP request and response. He reported the following findings: The CwicSmart, IDN OpenSearch and CWIC OpenSearch return the result, navigating the user through the two-step process. The ‘Programmatic client’ was achieved, and best practices are sound based on the above achievement; the document is informed by the implementation process. IDN and CWIC coupling was a hurdle but it was not insurmountable. CwicSmart provides an intuitive, user-friendly interface despite being OSDD driven, and resource type is missing from the Best Practices ‘you are searching for granules!’ CwicSmart and EarthData OpenSearch implementations other than IDN/CWIC include ECHO, but other ESIP and OGC implementations are as yet unknown. Preservation of parameters between APIs required work. OSDD to User Interface rendering takes less than a second. Geometry input rendering requires some work (future iteration).

Archie was asked if the data link is mandatory in the response content. He replied that it is not, but probably should be as it contains information that will inform the user. Yoshiyuki asked if there is a dedicated wiki page for CWIC OpenSearch best practice. Yonsook said that they have put together the documentation and there were changes as the implementation progressed. The plan is that once this is firm, it would be put on the CEOS website. Yoshiyuki asked if the GCMD keyword parameter is supported in the IDN OpenSearch. It is. He also asked if there is any ranking available. Yonsook replied that this has not been explored yet.

## FedEO

### Status

Mirko Albani gave a presentation describing the FedEO Status. He began with a description of HMA, including the HMA build-up, which followed a two track approach. He listed the HMA standards, defined through the work of 25 companies and 10 countries, and the contribution of HMA project partners. He listed the HMA implementations done in the last years for agency developments and Copernicus contributing missions.

He described FedEO, a prototype system providing a brokered discovery and access capability to European and Canadian EO missions based on HMA and other interfaces. He showed a diagram of the FedEO brokered architecture, a gateway exposing an OpenSearch interface. He listed the current list of protocols (backend connections supporting a list of OGC protocols).

Mirko reported that the FedEO end-point/component and demo client portal are being migrated to ESRIN. M2M External access tests with GEO Discovery and Access Broker (DAB) have started. The OpenSearch gateway is available, and further catalogues interfacing ongoing within the HMA-SE project including interface for searching/accessing CWIC collections. Mirko listed some statistics of discoverable and accessible collections and granules. He also described the FedEO Client Partner Guide.

### Demonstration

Yves Coene gave a demonstration of FedEO, showing the two step search approach. The demo showed a dedicated client, the other a simple browser. Step 1 is a search dataset series (parallel search in 4 catalogs - see below) and  step 2 is a search datasets inside the selected dataset series. Yves began with a simple web browser and showed several examples of searches. The second part of the demonstration uses a dedicated client. The client makes a request to the FedEO gateway to the collections, and results are returned. The collection catalogue also has services where the user can specify keywords.

### Future Work

Mirko described the plans for future work, which involve completing the FedEO platform installation at ESA/ESRIN, and populate dataset series catalogue with dataset series metadata for all available series. Currently, not all dataset series have ISO19139 metadata. The team also will integrate additional back-ends and add RESTful interface in addition to SRU-style interface, support content negotiation (via HTTP header) and alternative to httpAccept parameter. Support for metadata translation and for W3C RDF responses and sru:recordSchema for ISO metadata is also planned. Finally, they will align with the CEOS Best Practice, including addition of “icon” link for thumbnails, simple GEORSS instead of georss:where, and support of more queries.

### Conclusions

Mirko concluded saying that seamless and harmonised access to heterogeneous EO datasets from multiple mission ground segments is an operational reality in Europe and Canada –  HMA is the European model and contribution to interoperability in the Earth Observation domain. The FedEO Prototype System provides brokered discovery (and access) capability for (European and Canadian) EO data through HMA standard interfaces, and implements the OpenSearch OGC interfaces for an increased number of discoverable and accessible EO data collections, and for interfacing with CEOS community catalogues and clients.

Yonsook thanked them for the exchange of access to test CWIC and test FedEO, noting that it is good that the testing can highlight the differences and find the common way to implement. She recommended the initiation of discussions on the differences. In response to a question, Mirko confirmed that they use an opensource CSW in their demonstration, and it is available on the HMA wiki. The portal is not publicly available yet, but in about one month when moved to ESRIN it will be. The FedEO OpenSearch end point is publicly available now.

Jérôme asked Yves if he can add his own endpoint to his system, or should he send it to the ESA team to insert. Jérôme has some OpenSearch endpoints, and wants to know what is the process to insert them into FedEO. A small slide set will be prepared by ESA to describe the process.

**Action WGISS-37-11: Mirko Albani to prepare a small slide set to describe the process to insert OpenSearch endpoints into FedEO.**

## CWIC Project

### Introduction

Martin Yapur gave an introduction to the session, acknowledging the many people that are participating remotely. He added that his role in CWIC will transition to Ken McDonald, who will assume the position of co-chair from NOAA. He thanked Ken for accepting this responsibility.

### CWIC Report

Yonsook Enloe gave a report on the CEOS WGISS Integrated Catalog project, explaining what it is, and describing the architecture, comprised of middleware, which provides an access point for an inventory-level search at CEOS agencies who are CWIC data providers, the clients/portals (user interfaces to access cross-discipline data from CWIC data providers), and the IDN (provides clients/portals directory-level search of CEOS agencies who have registered their collections in the IDN).

Yonsook gave some basic information about CWIC, and described the CWIC teams, which include the participating partners. The team needs to consider end to end implications for assumptions and approaches, diversity of providers and clients, and scalability and maintainability of solutions. She noted that at the October 2012 CEOS Plenary, Mike Freilich (NASA) announced that the U.S. government agencies - NASA, NOAA, and USGS – will provide long term funding and resources to the CWIC activity starting in May 2013. The IDN existed before the CWIC initiative and provides other services to CEOS and GEO beside collection level discovery for CWIC. For this reason, at the present time the IDN funding will remain a contribution from NASA.

Currently, the CWIC Data Partners, who provide a major source of satellite data inventory search and data access in GEO, include NASA, USGS (LSI), INPE, NODC/GHRSST, CCMEO; development partners are AOE, ISRO, NOAA CLASS, ROSCOSMOS, and EUMETSAT. CWIC Data Partners are working on consistency for CSW interface and also for the “CEOS OpenSearch” interface. Details of each data partner API are on the CWIC webpage in the CWIC connector API report. This consistency involves supporting same search criteria, pagination, chronological (most recent first) sort order for returned results, online data access/order URL or email order, exceptions code handling (to convey to the user, the data partner specific information or other status). If spatial criteria is mandatory for the provider, what the default spatial criteria should be (e.g. global). If temporal range is required, then send exception condition no “natural” default for temporal range.

Yonsook described the CWIC Data Partner responsibilities, and listed the Client Partners, including the CWIC-Start Prototype, the CWIC-Smart Prototype, the LSI Portal, COVE, and GEO Partners (GEO DAB, GENESI, and GEO Portal). CWIC provides extensive support for new partners, and new partners are welcome.

In terms of OpenSearch, CWIC is conducting a broad review of the OGC Geospatial and Temporal Extensions and OGC Extensions for EO documents in summer 2013 with ESIP OpenSearch implementers. Comments were given to the CEOS OpenSearch team who submitted it to ESA. Most comments were incorporated into the revised OGC spec released in late fall/winter 2013. Over the past few months, a series of bi-weekly telecons have occurred with the CWIC, IDN, and CWIC-Smart teams, discussing an overall design for the OpenSearch implementation, identifying design/implementation issues, coming to resolution on these issues. In January 2014 a CWIC team meeting was conducted, focused on making decisions on OpenSearch implementation issues and firming up the CWIC OpenSearch Best Practices. The OpenSearch implementation according to the CWIC OpenSearch Best Practices document at IDN, CWIC, and CWIC-Smart began in February, and early prototype implementations made accessible for team testing. Future plans are to compare the CWIC and IDN OpenSearch implementation interfaces with the FedEO OpenSearch interfaces. Major parts of the CWIC OpenSearch Best Practices will be put into the CEOS OpenSearch Best Practices wherever possible. Future plans are to come to an agreement within the CEOS OpenSearch team on the CEOS OpenSearch Best Practices and to revise the software, if necessary.

The CWIC servers are working well on a new hardware platform at USGS. The team is solidifying test plans and processes to support new CWIC server enhancements, new data partner addition, IDN/CWIC synchronization, data accessibility testing (new data, confirmation of existing data), and automating testing wherever possible. Enhanced metrics collection and display are being added.

CWIC is now offering support for OpenSearch, and Yonsook noted that the CWIC server team implemented email ordering support in the CCRS CWIC connector which populates an email with detailed information about the granule the user wants to order. IDN/CWIC synchronization plan was simplified with the development of the IDN “tagging”/mapping tables. The metadata about metadata is kept separately as “tags” or mapping table. CCMEO became an operational data partner (Radarsat-1 & Radarsat-2), and COVE (CEOS Visualization Environment) tool is starting work to access Radarsat-2 metadata through CWIC. In late 2013, ROSCOSMOS announced plans to become a CWIC data partner, and in April 2014, Eumetsat asked for more information about becoming a CWIC data partner using the OpenSearch API; an informational telecon scheduled for early May.

Future plans are to work with the CEOS OpenSearch team to come to agreement on the CEOS OpenSearch Best Practices, and align IDN/CWIC OpenSearch implementations with the final version of the CEOS OpenSearch Best Practices. Interoperability testing with the FedEO OpenSearch implementation is planned, and also a study of the feasibility of FedEO connector to CWIC. The team plans to produce new documents to update the CWIC Data Partner Guide, CWIC Client Partner Guide for OpenSearch, and to support the developing CWIC Data Partners to become operational. They will develop strategy/plans for supporting VCs, WGD, SDMS, etc. for data access issues, and continue to support GCI integration, and develop a strategy for “Service Level Agreements” (how to get agreements on improving the reliability of the CWIC service, including agreements with data partners).

Both the IDN and CWIC integrated with GEO, and are accessed by the GEO components (Geo Web Portal, DAB, and GENESI). IDN provides collection metadata for over 24700+ data collections available to GEOSS (April 2014), with 9600+ of these data collections tagged as “geossDataCore”. Registering a data collection in the IDN in effect registers the data collection in GEOSS. A data collection must be registered in the IDN to be CWIC accessible. CWIC provides access to over 1900+ (April 2014 figure) data collections with inventories (over 70 million granules, adding granules daily from live missions). Providing technical support for GEO component teams accessing IDN and CWIC. GEO Director Barbara Ryan noted during the GEO session at the Nov 2013 CEOS Plenary that of the 65 million granules accessible in GEO (Oct 2013), CWIC provided access to over 50 million granules.

Glenn Rutledge asked about CLASS. Ken replied that the current plan is to work with the datacenters that will be interfacing with CLASS. When the datacenters have the interfaces complete, CWIC can begin working with them. Glenn said he would try to give a little energy to that.

Yoshiyuki asked how the GEO DAB are handling the two step search. Yonsook said they are well aware of it, and have successfully tested access. Martin asked if Yonsook could provide a status of the USGS servers. She said there are four virtual servers set up already and operational; the performance is perfect and the support that USGS provides is much appreciated.

Richard mentioned the WGISS organization, asking if it makes sense to create an interest group that represents CWIC, FedEO and OpenSearch, perhaps called interoperability. WGISS needs a clear organization for this, with good outside impact.

### GCMD-CWIC OpenSearch Implementation

Thomas Cherry gave a presentation of the GCMD-CWIC OpenSearch implementation. He gave an overview of the functionality, and described the additions for CWIC (client ID, optional secondary OSD, parameter extension, and improved pagination support). He also gave a demonstration of the system.

Jérôme asked about performance due to pagination, since you cannot cache the search; do they need to perform a count to get the pagination. Thomas replied that they get the minimum DIF and sort that, then later get the full DIF. This is manageable since it is at the collection level. Richard asked about the parameter extension data model, the allowed query for the OpenSearch interface. Thomas replied that the use a go box, and start and stop time; for search terms they can use GCMD terms. They do foresee things like percentage of cloud and other such parameters, and are in discussion for that.

### CWIC OpenSearch Implementation

Yuan Zheng Shao gave a presentation of the CWIC OpenSearch implementation. He began with an analysis of heterogeneity among existing data providers, having web portals, different query language and queryables, different metadata models, and different data access methods. He displayed tables showing the data provider analysis, highlighting the similarities and differences in terms of search criteria, native query method, and data access URL. In order to discover data from multiple data centers, users need to deal with different web portals, manage multiple user account information, become familiar with different query interfaces, and understand different metadata models.

Yuan Zheng showed a diagram the CWIC OpenSearch Architecture, and listed the design standards, which include CWIC Best Practice, OGC 10-032r8: OGC OpenSearch Geo and Time Extensions, OpenSearch Draft 5, and ATOM Syndication Format. The aim of the CWIC OpenSearch design is to generate an OpenSearch description document dynamically based on the dataset identifier. Instruct the granule-level querying, and customized response for each dataset, hard-coded the dataset identifier in the query template. The parameters are datasetId, used to specify dataset identifier (optional), and clientId, used to specify client identifier (mandatory).

* Request (datasetId): The dataset identifier (datasetId) parameter is used to specify the dataset identifier which could be retrieved from IDN as DIF Entry ID. This parameter is a required parameter. The client can not specify more than one dataset in single request. The client identifier (clientId) parameter is used to identify user information.
* Request (temporal): Temporal Extension (optional) adopted OGC 10-032r8. Parameter values are time:start and time:end. Format is a character string with the start of the temporal interval according to RFC-3339.
* Request (GEO): GEO Extension (optional), adopted OGC 10-032r8. Parameter value is geo:box - the bounding box specifying the area of interest; format he box is defined by "west, south, east, north" coordinates of longitude, latitude, in an EPSG:4326 decimal degrees.
* ATOM Response: Used namespace in ATOM Response listed. Also the <feed> element, <feed>/<entry> element, <feed>/<entry>/<link> element, <feed>/<entry>/<link> for OPeNDAP

Yuanzheng showed a diagram of CWIC OpenSearch sequence diagram, and a diagram of CWIC OpenSearch interactions.

### Error Handling

Archie Warnock gave a presentation of CWIC OpenSearch error handling. As background, he said that error handling in CSW was implemented primarily by returning exceptions to the client, and most error conditions in shared code base are already identified from CSW experience. OpenSearch requires errors to be handled via HTTP status codes, not exceptions, and HTTP Status codes also permit server-supplied text which can be used for human-readable error messages. Clients can modify the error text returned from the server for explanation to end users. CWIC back-end components do not necessarily know whether they are being called from a CSW request or an OpenSearch request. Errors are returned as exceptions from the connector components to the calling main program. The main program does know whether the request was CSW or OpenSearch and returns to the client either an exception (for CSW) or an HTTP error status (for OpenSearch) with appropriate descriptive text.

HTTP 4xx status codes refer to errors from the CWIC server (mediator and connectors) since the CWIC component do the basic syntax checking on incoming requests. A few may be related to internal CWIC server errors. HTTP 5xx status codes refer to problems in connecting to or parsing responses from the remote data provider system, since these exceptions are generally not correctable nor controllable from the CWIC software.

The types of errors handled are invalid request format, client included invalid search parameters in request, client requested too many records, too-large spatial footprint, etc., requested parameter values were invalid, remote system and communication errors, and other miscellaneous errors.

### CWIC-Smart: A Generic OpenSearch Client

Calin Duma gave a presentation on CWIC-Smart, a generic OpenSearch client. The rationale for implementing CWIC-Smart is to understand real world challenges of implementing a two-step OpenSearch client against GCMD (datasets) and CWIC (granules) initial implementations by providing client feedback to CWIC and GCMD OpenSearch teams and refining and testing their individual implementations. Other aspects of the rationale are to validate and improve the initial CWIC OpenSearch Best Practices document, and assess the feasibility of developing a generic OpenSearch client based on the document.

CWIC-Smart implementation details were given: Ruby on Rails application hosted on the ECHO hardware; JavaScript / jQuery used for AOI and TOI widgets as well as basic client-side DOM manipulation; UI only needs the location of the root OSDD (configured for GCMD Datasets OpenSearch); UI works against ATOM responses, and becomes more user friendly with regards to the inputs if OpenSearch implementation uses the Parameter Extension to describe supported parameters in more detail than the template allows it.

OpenSearch challenges and opportunities are:

* Specification draft documentation is spread over OpenSearch, Extensions, ESIP extensions etc. CWIC OpenSearch best practices helped the GCMD, CWIC and CWIC-Start teams by clearly explaining all the mandatory requirements and providing concrete examples for immediate use. CWIC OpenSearch best practices contains references to all specification drafts necessary to implement OpenSearch according to the mandatory requirements.
* It is currently impossible to derive input fields styling information from the current OpenSearch artifacts. The CWIC-Smart team developed an OSDD schema that can serve for basic styling, however more thought is needed on how to convey styling information via the OpenSearch extensions and associated artifacts. CWIC-Smart currently has fixed width input fields.
* It is difficult (not impossible) to convey valid values for the input fields. The Parameter Extension provides min, max, title, pattern, step, option which provide a good start, however they are not used by many OpenSearch providers. The 2-step mechanism allows for dataset specific parameters and valid input fields.

Calin gave demonstration of GCMD dataset search followed by CWIC granule search in the selected dataset. He also pointed CWIC-Smart to other OpenSearch providers to demonstrate the generic nature of the UI (ECHO, Mirador, NSIDC Hydro, and ESA OpenSearch).

### IDN Metadata Mapping Table

Michael Morahan gave a presentation on the IDN metadata mapping table. He explained that it is a feature for tagging metadata records with arbitrary "flags” to allow external partners to organize collections of metadata. This would allow partners to create collection subsets highly customized to a specialized discipline or interest outside of what is defined in metadata. Partners creating collections of metadata need not be involved with the metadata authoring process and no changes are required on the author’s part. These tags are not publicly displayed in any web interface. The tags can be used in creating IDN portal subsets or any other searches on IDN. He listed and described the recommended fields, and gave an example of adding a new value to the mapping table, and an example of the GET and REMOVE calls.

Michael commented that this capability will be very useful in identifying subsets, and has a lot of application; CWIC tested it successfully. Michael thanked the CWIC team for their feedback.

Patrick King asked if there is any way to recover if an entry has been deleted. Michael replied that it is, as they keep a log from which it can be recovered.

### CWIC/IDN Synchronization Plans

Lingjun Kang gave a presentation on CWIC/IDN synchronization plans. Currently the dataset list and dataset valid (i.e. spatial extent and temporal footprint) are synchronized, and the IDN Mapping table is a new synchronization source. The new features of the IDN mapping table are dataset status, and information for dataset synchronization on the CWIC side.

Steps for adding new datasets to the IDN/CWIC were described. During dataset registration, data provider inputs following info to IDN mapping table: Entry ID + Native dataset ID + data provider. When three fields are all populated, IDN updates dataset status as ready for CWIC testing. CWIC tests datasets and updates dataset status dataset passes testing. The IDN migrates datasets and CWIC PROD synchronizes from IDN PROD.

Removing a dataset from IDN/CWIC steps are: IDN ‘remove’ dataset from IDN PROD by tagging ‘CWIC\_PROD’ as ‘false’ and ‘CWIC\_TEST’ as ‘true’. CWIC-syn detects removed datasets through IDN/CWIC PROD synchronization. CWIC performs testing on removed datasets and report to IDN team and data providers. IDN and data providers make final decision on dataset removal based on CWIC testing report.

### Testing Environment for Data and Client Partners

Lingjun Kang gave a presentation on the testing environment for data and client partners. He began with an overview of the testing environment and described preliminary testing for connector development, including the trigger and the testing metrics. He displayed example reports of CSW query interface compatibility metrics, CSW returnable compatibility metrics, and CSW pagination compatibility metrics.

Lingjun described the deployment testing of the OSDD search requests and response, the Atom response, and the error handling. He also described testing for dataset addition and removal, noting that the testing metrics include accessibility and response validity. Daily dataset accessibility testing is conducted, checking the granule number for each dataset, and the query response time for each dataset. Adhoc CSW testing includes the CWIC web-based test page, NASA CWIC-Start client, and the CWIC STATIC server.

Yonsook commented that all the plans set up and automated have made CWIC access more reliable and dependable.

### Metrics: Current and Future

Weiguo Han gave a presentation on current and future metrics. The purpose of these metrics is to answer questions from stakeholders, sponsors, partners, and other users. With more integrated catalogs and more client requests, it is desired to develop mechanisms and metrics for determining reliability and quality of CWIC service. The previous procedure of creating monthly report was laborious and time consuming, and metrics information could not be presented interactively and responsively.

Weiguo described the metrics information collection, where the CWIC Mediator retrieves and stores information in the format as seen below when handling CSW requests from clients and responses from integrated catalogs. Six Java classes are defined to hold the requesting information for catalog, operation, output, country, and dataset. The free java packages used are RandomAccessFile, MaxMin GeoIP, and JSON. Simple. The Ext JS is used for building a responsive and intuitive web dashboard like portal. Several demonstration charts were displayed.

In summary, the new methodology allows for drill-down into details of catalog and dataset of interest, displays detailed service metrics in multiple dimensions and provides powerful indicators of CWIC performance. It also filters metrics on-the-fly and updates visit statistics automatically, creates the periodical reports in seconds, provides interactive tables and graphs, and offers complete and detailed traffic analysis. Future plans are to add spatial extent and temporal range in the log file, view metrics information by time of day, categorize failures and count by categories, send failure alerts to developers and data providers, and add new features in CWIC CSW metrics application.

Yonsook suggested everyone look at the metrics link on the CWIC page of the WGISS website. These reports contain interesting information.

### AOE CWIC Status

Feng Lei gave a presentation on AOE’s CWIC implementation status. He began with a description of the new network environment, and the design for the ordering system. He reported that they have designed a universal web site for the AOE node due to differences in ordering systems from the different data centers.

Yonsook commented that WGISS is very interested in AOE getting their order system working, and Kang will contact them to see what kind of test support they can provide.

### ISRO CWIC Status

Nitant Dube gave a presentation on ISRO’s CWIC implementation status. He began with a diagram of the ISRO EO Catalogue system (IEOCS) overview, noting that the ISRO connector is based on CSW 2.10 connected to CWIC, to the MOSDAC and NRSC metadata. IEOCS integration with CWIC is progressing; the IEOCS server is moved to the MOSDAC Data Centre (this will be the operational scenario), and the security clearance for the server has been obtained. The MOSDAC connector integration is complete but for few minor interface issues. The DIFs have been circulated within ISRO for clearance and for tagging each data sets with the scientific key words. All DIFs will be available this month for registration with IDN. Nitant gave reasons for schedule slippage, all of which have been addressed.

Nitant described the Meteorological and Oceanographic Satellite data archival Centre (MOSDAC) metadata/data, saying that overall 84 DIFs are identified, and the following satellite and metadata/products will be available from MOSDAC connector: INSAT-3A VHRR, NSAT-3A CCD, Kalpana-1 VHRR, INSAT-3A Imager, INSAT-3D Sounder, SARAL, Megha-tropiques, and Oceansat-2. The data DIFs related to atmospheric science data products were listed and described. He also showed a table of INSAT-3D imager GEO-physical parameters (level-2), and the INSAT-3D sounder GEO-physical parameters (level-2).

Current and future plans include testing of IEOCS MOSDAC connector with CWIC and with operational datasets as part of IEOCS with CWIC (May 2014), registration of DIFS (May-2014), and integration of NRSC connector (Dec 2014). Within this year they certainly expect 100-200 DIFs, but should be able to move ahead quickly. He gave special thanks to the CWIC team for their support.

Karen commented on the large number of DIFs for the MOSDAC data center. Nitant stated that when the 84 DIFs are registered and the connector is tested, he will notify Brian Killough in the SEO that they are available to CEOS. Some of the VCs have named these as key datasets. Brian asked about ResourceSat-2 AWIPS metadata. Nitant said that it is included in the NRSC connector. The metadata will be freely available, from there the user will be directed to the NRSC data ordering system. Nitant said that if Brian has any special requests he can accelerate them.

In response to a question from Glenn Rutledge, Yonsook said CWIC does not require any specific data format. They will be providing these products through map layers and data services. Michael asked Nitant send some examples of the metadata to test the IDN’s ISO to DIF converter. Nitant said he would send five in ISO.

**Action WGISS-37-12a. Nitant Dube to send five examples of ISRO metadata in ISO to test the IDNs ISO to DIF converter.**

**Action WGISS-37-12b. Michael Morahan to do the analysis of the ISO to DIF converter on the five examples from ISRO.**

### CEOS Visualization Environment (COVE)

Brian Killough described the CEOS Visualization Environment (COVE), a browser-based tool using Google-Earth to display satellite coverage swaths and calculate coincidence scene locations. It is automated daily satellite position data from CelesTrak, and features saved bookmarks and state files, KML and KMZ input/output, custom regions, collaborative sessions, and a large mission database (240 missions, 647 mission-instrument combinations).

COVE has a few new features, including links to mission archives for Landsat 7/8, SPOT 1-6, Pleaides-1A/1B. Plans to add TerraSAR-X, TanDEM-X, RapidEye and Radarsat-2 soon, 2D global output in JPEG format and KML output for Google Earth, overlays for Landsat and Sentinal-2 data grids, and ASTER DEM, and translation to Spanish. Brian showed demonstration images of SPOT-6 and Pleiades, showing one area with multiple missions within one tool to see what is available.

The (beta) Coverage Analyzer Tool is a new analysis tool for archive analyses. Users select the date range, region, grid size (or fixed Landsat WRS) and cloud cover threshold. Output shows the number of acquisitions meeting the criteria within that region, with tabular output is coming soon.

Brian reported that Google has developed a new platform for exploring satellite data, called “Google Earth Engine”. It was developed by the philanthropy division of Google. The tool contains the entire Landsat-7 and Landsat -8 archive (Level-1T only) and other satellite datasets (MODIS and SRTM). Access to these data is rapid and analysis tools utilize cloud computing. Users will find Landsat scenes, multi-day composites and cloud-free mosaics. A small group of “trusted testers” are able to utilize a dedicated workspace for analyses and have access to an Application Programming Interface (API) for powerful programming. The SEO plans to develop a front-end interface to this tool using the API, and is currently working with Google.

Jérôme asked if the code is open source; Brian said no but they do have an API.

### NASA CMR

Andy Mitchell gave a presentation on the NASA Common Metadata Repository (CMR). NASA is trying to clean its metadata with an emphasis on metadata quality and on performance. He listed reconciliation progress and plans: DIF support added to ECHO, GCMD is programmatically monitoring ECHO for new collections and updates, assessment and correlation between ECHO and GCMD holdings has begun, initial pass will associate ECHO 10 collections with GCMD DIFs, and science coordinators will assess differences between associated records and work from easiest to hardest with providers.

Andy noted that the science coordinator will work with data providers to make changes at metadata source. CMR will support pluggable ingest adapters to allow in-line updates to ingested metadata if needed, and the science coordinator can make updates to metadata on behalf of providers when approved by owner. Emphasis on performance is a priority due to the large amount of holdings. Andy discussed the CMR transition and the metadata concept support.

Ultimately, this will result in streamlined processes and more engagement for metadata providers. Client developers and end-users will have more metadata, with richer, higher quality, and will discover a unified view of EOSDIS holdings, with easier access through a variety of clients, data casting. Metadata will be available in an ISO19115 compliant format.

Martin asked if CMR will adopt the APIs. Andy said all the APIs will be the same but there may be things that may need to be retired. Richard asked about schedule; Andy replied they are hoping to have a functional CMR by end of 2014. Richard asked if they see a performance difference between CSW and OpenSearch interfaces. Andy will investigate and report back.

### CCMEO Status

Patrick King gave a presentation on the CCMEO data provider status. He discussed the Earth Observation Data Management System (EODMS) Project status, noting that seven milestones have been completed, and deliverables have included the project management plan, requirements analysis, final design, implementation plan, draft ATP, and prototype delivery. The CEOCat database is still being populated until the EODMS system is put into production mode, and is currently the source of metadata for Radarsat-1 and Radarsat-2 OpenSearch and CSW. EODMS will be an integral component of the Federal Geospatial Platform (FGP).

Patrick reported that Radarsat-2 is an “active” instrument meaning that it transmits energy in the 5.5 cm. wavelength range to the Earth’s surface and measures the return of this energy to create imagery. Radarsat-2 products are distinguished by beam mode; elevation angle and elevation profile of the radar beam are changed to create an incident angle range.

Patrick detailed the CCMEO OpenSearch implementation, listing search parameters and key response elements. A temporal search example was displayed. He noted that format of metadata within <content> tag might change according to CWIC best practices, and Radarsat-2 scene metadata and browse will be harvested by COVE team via OpenSearch. He added that paging can be implemented easily within an Oracle database SQL query instead of programmatically sorting through query results. He also showed a slide describing the mechanics of ordering data.

Richard asked if they are using OpenSearch connection instead of CSW to CWIC. Patrick replied that they are using two protocols. OpenSearch is implemented using Shell and fairly easy to customize. Yonsook said the inventory database on OpenSearch has better performance, and added that they interacted with the COVE team to learn the best way to implement. This is a very good model for implementing.

Andy noted that a discussion during the Technology Exploration on the Open Data initiative would be helpful, as everyone is struggling to meet the requirement. Pat said that protocol options/choice are always an issue; a rest API was used seamlessly to meet the open data initiative.

### IGDIS ERS

Ovnan Tokhiyan gave a presentation on IGDIS ERS current state and prospects of development. The purpose is integration ERS information resources into a unified geo-information space. Tasks include orbit group of ERS satellites application planning, IGDIS ERS ground-based infrastructure application planning, information reception and processing from Russian and foreign ERS satellites, classification and storage of ERS products, ERS products unified cataloging, and access to IGDIS ERS information resources via geoportals and web-services.

Ovnan noted that IGDIS ERS has four subsystems: The planning and management subsystem, the subsystem of reception, recording and processing of ERS data, the subsystem of cataloging, storage and distribution of ERS data, and the communication subsystem. Ovnan listed the projects and missions available in the Roscosmos GeoPortal.

There are three main directions of development: enhancement of information reception from ERS satellites, processing capabilities enhancement, and enhancement of existing infrastructure for ERS data distribution centers. They are also creating cloud computing data processing centres in IGDIS ERS centres, placing of ERS products creation technologies in cloud infrastructure of IGDIS ERS data processing centres. Ovnan described ERS data processing requests execution, which can occur automatically by specified schedule, or by user specific request.

Interaction with CWIC is underway.

Richard commented that it is very interesting – the number of mission and data, and also the number of applications. He asked how they will connect to CWIC. Ovnan replied that they are thinking CSW because it is more familiar to them. Richard suggested more advantages with OpenSearch – it is a standard. Yonsook asked if the ERS data would be the first step. Aleksey said that there are future plans for other mission data. WGISS looks forward to additional discussions.

## CEOS Water Portal Project

Satoko Miura gave a brief introduction of the session.

### Status and Workplan

Satoko gave a presentation on the CEOS WGISS Water Portal project with an emphasis on status update since the last WGISS meeting. She began with an overview on the portal concept, noting that it will include in-situ, satellite, and model output data. The water portal is a distributed data system component of the Data Integrated Analysis System (DIAS) Program. The portal includes dataset search and access, and use case registration/browsing. She displayed a diagram outlining goals, and listed the data partners, and an extensive list of available data. Satoko continued with a diagram of the current architecture.

Recent updates to the portal are the addition of the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) as a new data partner. This resource adds in-situ data and two interfaces: “WaterOneFlow+WaterML1” and “REST+WaterML2”. A new GUI has been developed, and new architecture prototyping is underway for the purpose of reducing data partner labor, integrated operation flow, and easier operation. She displayed a diagram of the new system architecture. Satoko announced the development of a three minute demonstration video prepared for the GEO-X Ministerial Summit in January 2014.

Future plans for 2014 include the transfer to the new architecture, and the addition of new data partners NOAA/NCDC and GEO DAB (a prototype was already connected to the GEO DAB in 2013, and an experiment of accessing GEO DAB using OpenSearch is planned). During 2014-15, synergies with other domestic systems such as DIAS are planned, and discussion for this is underway. A user authentication function is also planned.

Satoko made a request of the IDN Interest Group. She stated that they would like to continue using IDN/GCMD to enable 2-step search (except for datasets from 2-step search enabled servers). But they would like to keep DIFs for the entire water portal datasets “not visible” to the public until these are finalized. Michael said that would be no problem.

Richard commented that at CNES they have Hydroweb, which gives the height of rivers and lakes from altimetry satellites; it is OpenSearch compliant. Yonsook asked Satoko if they create and ingest metadata to the database manually. Satoko replied that they do, but it is only a snippet of each dataset-level metadata and that is far less volume compared to holding the entire granule level metadata.

### Demonstration

Yoshiyuki gave a demonstration on accessing CUAHSI datasets using the CEOS Water Portal. The main capability is to give access of water science data from servers scattered all over the world. He showed an example for surface water temperatures.

Glenn asked if the data demonstrated was from a model output data. Yoshiyuki replied that CUAHSI datasets are mainly in-situ but there may exist some model output data.

### Architecture Renovation

Yoshiyuki gave a presentation on the new system architecture that has been examined for the last few months. The idea of the new architecture is outsourcing the entire catalog of the portal, by leveraging IDN and GI-cat, an open source software. He explained the results of the feasibility study on the new system architecture, saying the portal would be transitioning to the new architecture in this year, and would be handed over to a third-party agency for the operation in two years. For the dataset level catalog they will create DIFs for the all the datasets and ingest to IDN. All the granules will be harvested to GI-cat (OSS).

Yoshiyuki described their approach to the 2-step search. For the first case, they would use MWS for the dataset search, and OpenSearch for the granule search. In the second case, the dataset and granule search would both use OpenSearch. He displayed a system architecture diagram, and one describing the 2-step search. The new architecture will require less operation labor, less work in adding new data partners, better search support for users (free keyword, GCMD keyword, ECV). Disadvantages are with the catalogue/data granularity. Feasibility and performance are to be determined.

During a feasibility study with the IDN they tested with sample DIFs and the IDN MWS (Metadata Web Service). The Catalog Web Service was provided by IDN (HTTP GET), and search parameters used were GCMD Science Keyword, ECV Keyword (Ancillary Keyword in DIF), Free Keyword, Time, Geographical Area, Project (= ceoswaterportal). The outcome was that it works well, with fast search response. However, search with bbox is not working and will be discussed with IDN team.

A feasibility study with GI-cat was also conducted, and results were displayed. Issues encountered were unsupported data source, database robustness with harvest error for 100000+ files per single source. Also, time/area search does not work with non-ncISO OPeNDAP/THREDDS servers. A workaround for unsupported data sources and those with large volumes of data is to keep local database and add OpenSearch interface. For missing time/area search a possible workaround is to use the filename, but need to solicit support of ncISO to existing/candidate data partners.

Yoshiyuki displayed a prototype mock-up, and noted that as a result of the feasibility study they will transition to the new architecture this year. Currently 2,244 DIFs are being ingested, and they will consider metadata tagging instead of “project=waterportal” in DIF. They will also replace MWS with OpenSearch for dataset search.

Kristi asked if they have USGS datasets available from the portal, since USGS has many in-situ rain gauge observation datasets in relation to water science. Satoko replied that not yet but would love to have it. Kristi will send Satoko a website.

There was a discussion regarding the public accessibility of the datasets (DIFs) from IDN/GCMD. Satoko noted the time consuming effort required for the coordination with each data partner. In a sense, it is a bit hard to understand that they can be publicly accessible through water portal but not through IDN. The possible solution could be setting up a separate IDN-like server for this kind of use. In the IDN there will be datasets from groups that are not part of CEOS, for example in-situ data.

Richard asked how they handle the difference of response time between a search on GI-cat and a search on the local database. Yoshiyuki replied that the granule level search would only occur on a single dataset at a time. That means there will not be situations where the portal sends the search query concurrently to both catalogs. So the difference does not matter.

# WGISS Plenary Session, Part II

## Future Meetings

Andy began the presentation on future meetings, saying that WGISS is seeking volunteers to host WGISS-39 and -40. Satoko said JAXA is considering hosting WGISS-39 in Tsukuba, the week of May 11, 2015. Andy said he would check the CEOS calendar for any conflicts.

Tamara Ganina gave a presentation on details for the WGISS-38 meeting in Moscow. The meeting is scheduled for September 29 to October 3, 2014, and will be hosted by JSC “Russian Space Systems” (NTs OMZ) and ROSCOSMOS. She indicated there would be free transfer from the hotel to the NTs OMZ venue, and 30 rooms will be blocked, at a rate of $150-200 per day. A tour of NTs OMZ and a group dinner are planned. She provided details for the special form required for the visa application. The deadline for the visa application is July 21.

## Chair Report

Richard Moreno summarized a number of topics from the meeting as follows.

### Recovery Observatory Summary

There is a proposal to set up a new interest group gathering WGISS activities related to Disasters, including the Recovery Observatory (RO). This group would provide a natural liaison to WGDisasters. The proposal is to start Recovery Observatory Infrastructure project under the umbrella of Disasters Interest Group. CEOS has shared specification and design, with maximum re-use of existing software, procured by CEOS agencies. Dedicated development and integration activities will be funded by CNES with two full time developers. Version 0 should be complete in time for the CEOS plenary, and version 1 for the middle of 2015. Organization and responsibilities need to be identified among WGISS members, with suggestions on how to proceed regarding resources, documents, teleconference, documents exchange, software contribution.

Karen commented that she understood that there is a CEOS process for new initiatives, but it is still in editorial comments. Within a working group it is not necessary to follow the process, though activities should be vetted by SIT. Richard said the SIT endorsed the RO last week. The formation of the Disasters Interest Group is still in discussion, and there have been no objections. Wyn suggested calling for participants to the Disasters Interest Group, and Richard recommended that Karen Moe be the lead, as she is already a natural liaison to WGDisasters. Karen said she would confer with her agency regarding this role. Richard added that a flat organization is recommended for WGISS.

The participants agreed on the formation of the Disasters Interest Group, and the Recovery Observatory Project. The final decision for this will be made at the next WGISS Exec teleconference. Karen said she has heard significant interest for this activity, and Andy suggested caution on labelling it to ensure that WGISS is supporting WGDisasters, and the infrastructure of RO, and suggested Disasters Infrastructure Interest Group. Martin wondered why close GA.4.Disasters and then re-engage - Karen explained that GA.4.Disasters was a project for the architecture activity, with a specific end date that was fulfilled.

WGISS is concerned only on infrastructure as it relates to disasters. Karen noted that within the architecture, there is room for the enterprise, information and computational viewpoints. The focus of the WGDisasters is “what” data, with no consideration as to how to get the data. So this is an opportunity for WGISS’ expertise. Satoko added that WGDisasters has a specific need for infrastructure help, so it is appropriate to respond. Yonsook noted that WGISS is already working on data access and is devoting a lot of resources to this, adding that there are still many challenges.

Another suggestion was to set up a more generic group, tying into the liaison with the VCs, to the outside; WGISS can provide these groups with a path to get to the data, and to the interoperability. Satoko commented that this discussion should be part of the bigger context of WGISS structure.

### WGClimate ECV Inventory

WGClimate requires support for providing access to ECVs stored in a database. Yet to be determined are potential milestones. Two possible solutions are disposal of tools for the potential Software Repository, and provision of OpenSearch expertise.

Christina Lief noted that this effort it is at a very early stage. There will be a meeting in May where it will be discussed. Andy asked her to reach out to the WGISS group after more is known. WGISS will await a more precise concrete request for support.

### CEO Report

Three topics were highlighted: CEOS 3-Year Workplan, the Working Group process paper, and the new Initiatives paper.

It will be necessary for the WGISS 5-Year Plan to be updated and perhaps changed to a 3-Year plan to match the CEOS Workplan. Recommended extracting organizational information, and developing interest group and project terms of reference (TOR). After some discussion it was agreed that the 5-Year Plan should be converted into a generic WGISS TOR, with clear definitions of interest groups and projects. Wyn, Michelle, Ken, and WISP agreed to take the task.

**Action WGISS-37-13: Wyn, Michelle, Ken, WISP to review the WGISS 5-Year Plan to make it more generic and convert it into a TOR.**

### GEO Secretariat Report

There is a need for coordination and management, and Osamu should be contacted to determine how WGISS can support GEO. It was noted that the CEOS representative in IIB is Ivan Petiteville, who is no longer part of WGISS. Yonsook asked if IIB is related to GCI or is it broader than that; it would be a good question for Osamu. At WGISS-37 he was informally suggesting to get more WGISS involvement with data management systems. WGISS input is something that the GEO Secretariat would like to have. Satoko noted that formally WGISS cannot have representative, but could coordinate with Satish to see if WGISS could get the formal representation with the IIB. This may be an example of where WGISS can support WGCV since Satish is representative for the Data Preservation task. Another suggestion is to ask Ivan to make a report to WGISS on IIB aspects that relate to WGISS.

**Action WGISS-37-14: Richard Moreno to ask Ivan to make a report on IIB activities at WGISS meetings.**

### SEO

WGISS needs to clarify its role with SEO within CEOS and to determine the level of support required. Andy suggested putting this activity into a group that works on interoperability, or outside interactions. SEO is the support for a lot of activities because it is more connected within CEOS and GEO. Brian does rely on WGISS for the data systems expertise. It is important to maintain WGISS visibility and it was suggested that VCs and SEO acknowledge to SIT and CEOS any WGISS collaboration.

### How to improve WGISS

Outreach:

* Clarify that WGISS participation can be remote or in person attendance at meetings, participation in interest groups and projects.
* Publicize “WGISS benefits” presentation.
* Improve WGISS web portal. Include the “WGISS benefits” presentation, organizational structure, and up-to-date and valuable information. Key points should include a synthesis of Technology Exploration Interest Group, and a statement of the benefits of interoperability.
* Organize relevant side meetings at SIT or Plenary.
* Present appealing, not too technical, synthesis of WGISS activities at SIT and Plenary with outreach in mind.
* Communicate well the value of coordinating and improving data systems and services.
* Increase interaction with VCs.
* Coordinate/collaborate/connect more closely with SEO.
* Characterize users, and which work will interest which users (Decision Makers, Agency Data System, science end-users); some are interested in users, other on systems or data.
* Share open source code (or just software). Allow any organization [WGs, VCs, agencies] to re-use for their own needs.
* Work with users and contribute to develop user-request-oriented system/data such as Recovery Observatory, and repository of available software / systems.

Andy noted that part of the problem with WGISS communication with VCs is that they are not sure what WGISS does or can contribute. Karen suggested describing WGISS products and services, perhaps as case studies showing how WGISS supported a VC. Satoko asked about a survey of all datasets used and required by VCs and whether it was available; if that initiative continues perhaps WGISS can work with that team. Most of the VCs have side meetings at SIT also, and WGISS can attend them to identify areas for contribution.

Martin commented that at any given time this meeting had an average of 15 remote participants. This is excellent outreach, and WISP needs to coordinate with CEOS to determine how to achieve a stronger presence on the CEOS website.

Andy repeated that a stronger relationship with WGCapD is important as they are in direct contact with the end users.

### CWIC/OpenSearch/FedEO

CWIC and FedEO are now OpenSearch compliant, and can both be connected to an OpenSearch endpoint server, though Yonsook said more work still is needed to be able to do the 2-step search.

Major parts of the CWIC OpenSearch Best Practices will be put into the CEOS OpenSearch Best Practices wherever possible.

When new development is to be done, OpenSearch is more appropriate than CSW (ISO or ebRIM); it is easier to implement and has better performance.

OpenSearch documents:

OGC-10-032r6 OpenSearchGeoTemporal.is an OGC standard

OGC-13-026r2 OpenSearch Extension for Earth Observation Products; will start the standardization process in June

Interoperability activities are unclear; there is need for a global system view and for a visible and unified message.

Proposal to create a new interest group, merging all current and future activities related to interoperability, keeping a flat / simple organization of WGISS (no subgroups), and with three or four co-leads.

Activities of the new interest group could include CWIC system and expertise, FedEO system and expertise, OpenSearch (finalizing standardization, best practice document, support for newcomers), IDN, Interoperability Handbook (simple, efficient and easy to maintain), statement with the benefits of interoperability, build a portal above all OpenSearch servers (CWIC, FedEO, other OpenSearch).

**Action WGISS-37-15: WGISS to find a name for the new interest group that covers IDN, OpenSearch, FedEO, and CWIC.**

### Technology Exploration

Andy provided the following synthesis of presentations and discussions from the Technology Exploration Interest Group:

Big Data and Services: Presentations were given by five agencies; INPE described Big Earth observation data analytics for land change monitoring, ESA described their ESA Earth Observation Big Data R&D, NASA the Big Earth Data Initiative, ROSCOSMOS the Roscosmos GeoPortal services, and NASU-NSAU described the big data challenge associated with the JECAM and GEOGLAM activities.

Cloud Computing and Semantics: CNES discussed quality assessment and land cover services in a collaborative clouds environment, and also providing semantic search using RESTo. NASA presented the Semantic Web for Earth and Environmental Terminology and the Semantically Enabled Scientific Data Integration

Visualization, Authentication, and Formats: HUNAGI gave presentations on the NASA World Wind Virtual Globe Technology and the WW Europa Challenge; NASA discussed the Global Imagery Browse System / Worldview and the EOSDIS User Registration System, and ESA the ESA EO Federated User Management. The ISO liaison discussed the ISO TC 211 - Revision of ISO 19115-2.

The interest group proposed the following steps:

* Advertise individual agency data systems and services on WGISS website.
* Promote open source software/technology or code snippets on the WGISS website; during the meeting, many examples of open source visualization software were mentioned.
* Develop a draft technical paper capturing the current ‘State of the Union’ for WGISS agencies for Big Data and Cloud Computing.
* Continue to actively monitor the development and implementation of authentication systems among WGISS agencies and GEOSS

Andy presented a Sample Wireframe for advertising agency data systems and services, and an Open Source wireframe.

### Software Repository

Proposal to set-up a software repository, maybe a web page managed by WISP. First list of software includes Mapshup / RESTO, NASA World Wind, NASA GIBBS, GI-Cat, GeoNetwork, CNES SITOOLS2, ESA SciDip ES (for data preservation), bbFTP / GridFTP.

### Data Stewardship

There were a number of presentations on Persistent Identifiers, and several solutions exist. As yet no directives or recommendations.

### External Collaborations

GEO / Climate: support related to interoperability.

ACC: expertise for data access and interoperability.

GEO Community Portal Activity; some WGISS member to participate, and report and discussions for next meeting.

## **WGISS-37 Actions**

Michelle Piepgrass reported that all actions from WGISS-36 are closed, and listed the actions resulting for WGISS-37.

|  |  |  |  |
| --- | --- | --- | --- |
| Action Number | Action Description | Actionee | Due Date |
| WGISS-37-1 | WGISS to coordinate with Ivan Petiteville and Osamu Ochiai to discuss structured activities where WGISS could support GEO, and identify the best lines of communication. |  |  |
| WGISS-37-2 | WGISS to send to the Standards Inoperability Forum (SIF) team the CEOS OpenSearch document when it is completed. |  |  |
| WGISS-37-3 | Mirko Albani to indicate instrument/mission combinations that are available through FedEO on the Data Policy Portal. This is a continuation of Action WGISS-36-4. | Mirko Albani |  |
| WGISS-37-4 | Michael Morahan to update the SEO’s spreadsheet of instrument/mission combinations noting which are available through the IDN on the Data Policy Portal. | Michael Morahan |  |
| WGISS-37-5 | Kristi Kline to discover a list of CDR/ECV nomenclature to send to the ESIP Federation. | Kristi Kline |  |
| WGISS-37-6a | Mirko Albani to send the invitation to WGISS all when he gets the announcement for the “Big Data from Space” meeting. December 2014. | Mirko Albani |  |
| WGISS-37-6b | Mirko Albani to send the invitation to WGISS all when he gets the announcement for the ESA-wide conference on Research, Technology and Innovation Associated to Large Amounts of “Space” data meeting. August 2014. | Mirko Albani |  |
| WGISS-37-7 | Andy Mitchell to summarize the WGISS-37 sessions on big data, cloud computing, semantics. | Andy Mitchell |  |
| WGISS-37-8 | Mirko Albani to prepare a plan of activities for the Data Stewardship Interest Group to present to WGISS and determine level of interest and participation. | Mirko Albani |  |
| WGISS-37-9 | Data Stewardship Interest Group to provide input to the GEO workplan for the WGISS contribution to GEO. | Data Stewardship Interest Group |  |
| WGISS-37-10 | Mirko Albani to update the purge alert distribution list. | Mirko Albani |  |
| WGISS-37-11 | Mirko Albani to prepare a small slide set to describe the process to insert OpenSearch endpoints into FedEO. | Mirko Albani |  |
| WGISS-37-12a | Nitant Dube to send five examples of ISRO metadata in ISO to test the IDNs ISO to DIF converter.  | Nitant Dube |  |
| WGISS-37-12b | Michael Morahan to do the analysis of the ISO to DIF converter on the five examples from ISRO. | Michael Morahan |  |
| WGISS-37-13 | Wyn Cudlip, Michelle Piepgrass, Ken McDonald, WISP to review the WGISS 5-Year Plan to make it more generic and convert it into a TOR.  | Wyn Cudlip, Michelle Piepgrass, Ken McDonald, WISP |  |
| WGISS-37-14 | Richard Moreno to ask Ivan to make a report on IIB activities at WGISS meetings. | Richard Moreno |  |
| WGISS-37-15 | WGISS to find a name for the new interest group that covers IDN, OpenSearch, FedEO, and CWIC. | WGISS |  |

## Adjourn

Richard thanked NASA for hosting this meeting, especially Andy Mitchell for the excellent organization. He expressed appreciation for the content of the presentations, and remarked that the discussions were very constructive. WGISS looks forward to WGISS-38 in Moscow.

# Glossary of Acronyms

AC Atmospheric Composition

API Application Programming Interface

CEO CEOS Executive Officer

CEOS Committee on Earth Observation Satellites

Charter International Charter on Space and Major Disaster

CoP Community of Practice

CSW Catalogue Service for the Web

CWIC CEOS WGISS Integrated Catalogue

DEM Digital Elevation Model

DIF Directory Interchange Format

ECV Essential Climate Variable

EO Earth Observation

ES Earth Science

ESIP Federation of Earth Science Information Partners

GCI GEOSS Common Infrastructure

GENESI Ground European Network for Earth Science Interoperations

GEO Group on Earth Observations

GEO-GLAM Global Agricultural Monitoring

GEOSS Global Earth Observation System of Systems

GIS Geospatial Information System

GMU George Mason University

GPM Global Precipitation Mission

GSDI Global Spatial Data Infrastructure

GUI Graphical User Interface

HMA Heterogeneous Missions Accessibility

ICSU International Council of Scientific Unions

IDN International Directory Network

IG Interest Group

ISO International Standards Organisation

ISPRS International Society for Photogrammetry and Remote Sensing

IT Information Technology

LSI Land Surface Imaging

NRT Near real time

OGC Open Geospatial Consortium

PoC Point of Contact

QI Quality Indicator

SEO Systems Engineering Office

SBA Societal Benefit Area

SDCG Space Data Coordination Group

SG Subgroup

SIT Strategic Implementation Team

SST Sea Surface Temperature

ToR Terms of Reference

VC Virtual Constellation

WADC WGISS Architecture Data Contributions

WCS Web Coverage Service

WG Working Group

WGCV Working Group on Calibration and Validation

WGCapD Working Group on Capacity Building & Data Democracy

WGClimate Working Group on Climate

WGDisasters Working Group on Disasters