MINUTES
OF THE
34th MEETING
OF THE
CEOS WORKING GROUP ON INFORMATION SYSTEMS AND SERVICES

Hyderabad, India
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Hosted by ISRO

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WGISS-33 Attendees

AOE	Feng Lei*
CEOS-SEO	Brian Killough
CNES	Richard Moreno (WGISS Vice-chair)
CCRS	Costas Theophilos, Patrick King*
GSDI/HUNAGI	Gabor Remetey-Fülöpp*
INPE	Lubia Vinhas*
ISRO	Nitant Dube, Rajeev Jaiswal, Vijaya Banu
JAXA	Satoko Miura (WGISS Chair), Atsushi Kawai, Yoshiyuki Kudo, Michelle Piepgrass (WGISS Secretariat)
NASA	Andrew Mitchell, Michael Burnett, Yonsook Enloe, John Evans, Michael Morahan, Kevin Murphy
NASU-NSAU	Sergii Skakun*
NOAA	Martin Yapur
UKSA	Wyn Cudlip
USGS	John Faundeen

* Via web conference or email

Additional ISRO participants: Dr. V. K. Dhadhwal, Senthil Kumar, B. Kartikeyen, Yogdeep Desai, Pradeep Thepliyal, A. K. Shukla, P. Aravinda Kumar, K. N. Babu, V. M. Ramaniyam, M. M. Ali, T. Radhika, A. Vijaya Banu, S. K. Verma, S. M Vralik, B. Santi Sree, R. Raj Kumar, N. Raghavender, S. SriSudha,N. Aparna, V. R. K. Sastry, V. Subramanian, Arulraj

1 WGISS/WGCV Joint Plenary Session, Part I

1.1 Welcome and Introductions

B. Santhi Sree welcomed the participants to the WGISS-34 and WGCV-35 meeting at the ISRO facility in Hyderabad, India. She introduced Satoko Miura, WGISS Chair, Gregory Stensaas, WGCV Chair, Mr. Kiran Kumar, CEOS Chair and Director of the Space Applications Centre (SAC), Dr. V.K. Dadhwal Director of the National Remote Sensing Centre (NRSC), and Dr. P.G. Diwakar, Director of Earth Observation System (EOS), ISRO Headquarters. She added that she invited the participants to enjoy the rich cultural heritage of India as they participate in the meeting.

Greg expressed satisfaction to hold the joint meeting at ISRO, given the WGCV vision and strong need for working group and agency cooperation; he looked forward to working together, in exciting times with the advances in storage, processing, and computer technologies coming together, bringing data to all the constituents of CEOS. There is tremendous opportunity at ISRO, taking the lead with its excellent space program, which is very helpful to move the working groups forward; ISRO's support is very valuable, and much appreciated. Greg expressed satisfaction to see ISRO attending and working with the WGCV and WGISS working groups, and looked forward to continued and enhanced support.

Greg thanked ISRO and the directors for hosting the meeting and was looking forward to fruitful discussions with ISRO on their datasets, and access to their archives, especially as they collaborate with WGISS and the CWIC team. Currently NRSC is supplying data from CartoSat-1, 2, 2A and 2B, ResourceSat-1, ResourceSat -2, OceanSat, TES, IRS-1D and IMS-1. He specifically acknowledged NRSC Director Dr. V. K. Dadhwal, Mr. Kiran Kumar, CEOS Chair, Director of Space Applications Center, Dr. Diwakar, Director EOS, ISRO HQ, and the meeting support and coordinators Rajeev Jaiswal, Senthil Kumar, Samir Pal, and Santhi Sree.

Satoko Miura seconded Greg's statements, and expressed thanks to ISRO on behalf of WGISS for hosting this joint meeting, and to the CEOS chair for supporting the working group activities. She noted that WGISS and WGCV had a joint meeting two years ago with fruitful discussions, and looks forward to similar fruitful discussion on future joint activities. She appealed to everyone for cooperation and support for this meeting, and repeated thanks to ISRO for their hospitality, being very eager to work with ISRO in the area of data access.

1.2 Meeting Logistics

Rajeev Jaiswal added that it is indeed his pleasure to welcome all, acknowledging the working group leaders, the colleagues present, and the participants who were not able to attend due to visa problems. He noted that this is the second working group meeting to occur in India; WGISS was in Bangalore in 1997 and WGCV in 2000. He added that the CEOS Plenary will be in Bangalore in October. He noted that 36 delegates from 19 space agencies are in attendance. He expressed one goal of the meeting, to improve the CEOS data systems, which is very important to ISRO.

Senthil Kumar explained logistical details in terms of transportation to and from ISRO, location of the various sessions and internet connectivity. He invited the participants to a group photo and to a traditional dinner Tuesday evening that ISRO would be hosting. He also noted that help desk services and medical services are available on site, and that lunch and tea breaks would be provided every day. He expressed appreciation to the attendees for their cooperation and participation.

1.3 ISRO Welcome Address

Mr. Kiran Kumar, CEOS Chair and Director of SAC welcomed all participants to the joint working group meeting, noting that this is possibly the third time in India for WGCV and WGISS. He added that it is ISRO's pleasure to host these meetings, as the contribution of ISRO to CEOS is steadily growing. He stated that ISRO was established in 1984 to optimize spaceborne operations, and is the focal point for international cooperation, policy, complementarity of data and exchange systems. He mentioned several existing missions, and discussed planned missions.

Mr. Kumar continued saying that CEOS has 30 agency members representing about 114 EO missions, and is expecting 100 new missions in the next five years and 784 instruments in the next 15 years. He noted that CEOS brings synergy into the activities of the agencies, and as governments and finances are tightening strings, it is imperative that agencies cooperate in order to benefit humanity and bring the services to the people, making the data available to the global community. CEOS brings together bilateral and multilateral programs, including the virtual constellations and working groups that are addressing issues of providing data that is usable on a common platform so the user gets the benefit of data from different sources seamlessly. Data that is not utilized or is only partially utilized is of little benefit and it is becoming more critical to access the older, archived data as the global community investigates climate change.

Mr Kumar wished both working groups a huge success, and that all will benefit from these activities. He acknowledged the work of Rajeev and Kiran to make this meeting possible and thanked Dr. Dadhwal for his willingness to host the meeting.

1.4 Adoption of Joint Agenda

Greg and Satoko asked the participants to review the agenda. There were no questions or modifications.

1.5 WGCV Goals and Objectives

Greg Stensaas introduced WGCV, listing its specific objectives of sensor-specific calibration and validation, and biogeophysical validation. The first is to document and establish forums for the assessment, recommendation and implementation of current techniques and standards for pre- and post-launch characterization and calibration. The second objective is to document and establish forums for the assessment, recommendation and implementation of techniques for validation of biogeophysical parameters derived from EO satellite systems. Meeting these objectives will include the promotion of the exchange of EO data, technical information and documentation, the investigation of possibilities for technical coordination and cooperation for space and ground segments, the coordination and analysis of cal/val campaigns and programs, optimizing and sharing of available facilities, expertise and resources as appropriate, and agreement on common terminology and definitions.

Greg noted that WGCV is doing international calibration with many entities and it has been very successful. The WGCV competences include

- One stop shop for all cal/val activities within CEOS

- International collaboration of sensor and product cal/val
- Expertise related to ground-based, airborne and satellite sensors used for the cal/val of satellite sensors
- Consultants for cal/val requirements and standards
- Development/identification of cal/val sites and continuing observations and inter-comparison of cal/val
- Quality assurance expertise to include definitions and methodologies required to establish traceable indicators for CEOS products

Greg displayed a chart of the CEOS structure, and one of the CEOS Implementation Process, which begins with a CEOS strategy, implementation plan and work plan, to implement the CEOS priorities (listed). WGCV has a large role to support cal/val and QA processes.

Three-year outcomes defined in course of the CEOS Self Study (CSS) are:

1. Cal/Val support to CEOS efforts needed: FCT/GFOI, JECAM, ECV validation and comparisons
    a. Continue toward definition and enhancement of cal/val test sites and processes
    b. Support to GFOI methods and protocols and validation of datasets and processes
    c. Support cal-val and quality aspects of ECV development
2. QA4EO Implementation with CEOS and GEO
    d. Working via IN-02-C1 task
    e. Develop common definition and methods
3. WGs, VCs, CEOS Task Leads, and CEOS communication
    f. Defining WG and VC points of contact to obtain WGCV support and actions
    g. Interaction process being worked
    h. 5-Year Plan updates to reflect CEOS WG and VC interaction

Greg introduced the incoming chair and vice chair of WGCV, and listed previous meetings. He also mentioned the CEOS Lybia-4 Workshop next week, hosted by CNES.

1.6 WGISS Goals and Objectives

Satoko Miura gave a brief overview of WGISS, explaining its goals, and displayed the WGISS structure describing each of the interest groups and projects. Satoko listed the three-year outcomes resulting from the CEOS Self Study

- Advancing CWIC.
- IDN development.
- Support of development of CEOS Portals.

Satoko noted for the third point that WGISS/CWIC is providing assistance to the SST VC (GHRSST) to become a CWIC data partner, and the LSI Portal can now access CWIC.

Satoko reported progress in 2012 for GCI integration. She elaborated that both the IDN and CWIC are integrated with GEO, and accessed by the GEO components (Geo Web Portal, DAB, and GENESI). The IDN provides collection metadata to GEOSS for over 21,629 data collections. She explained that registering a data collection in the IDN in effect registers the data collection in GEOSS, and a data collection must be registered in the IDN to be CWIC-accessible. Currently CWIC provides access to 1,778 data collections with inventories. WGISS is providing technical support for GEO component teams accessing the IDN and CWIC and is providing review comments on GEO documents with regards to IDN, CWIC and GEO capabilities to search and access satellite data.

Satoko stated that the GEOSS Data Collection of Open Resources for Everyone (GEOSS Data-CORE) is a distributed pool of documented datasets with full and open unrestricted access at no more than the cost of reproduction and distribution. GEO currently has 8668 data collections tagged as GEOSS Data-CORE, and the IDN provides tagging for 8181of those data collections. The IDN team is ready and willing to tag data collections from CEOS agencies as GEOSS Data-CORE if requested, and tools are available to register data collections in the IDN.

Satoko also listed specific status and progress in terms of data accessible with CWIC.

1.7 CEOS SIT Meeting Summary

Brian Killough gave a report of the recent SIT Technical Workshop on behalf of Tim Stryker, CEOS Executive Officer. The objectives of the workshop were to review CEOS progress against the 2012 Work Plan, to support successful CEOS 2012 Plenary outcomes and to consolidate CEOS contributions and reporting to major 2012 events and their key stakeholders. Brian listed a few key topics, adding that a lot of good work is coordinated amongst the space agencies.

New SIT actions for WGISS

- SITWS-2012-10: SDCG Co-Chairs, WGISS Chair, and SEO to confer to explore requirements and opportunities for information system for monitoring and reporting progress towards the GFOI global baseline acquisition strategy (report SIT-28 on way forward).
- SITWS-2012-12: WGISS to reach out to the SST-VC to discuss the integration of CWIC functionality in their data portal.
- SITWS-2012-31: WGISS/Satoko Miura to confirm WGISS participation in one or more of the CEOS CSSii document writing teams.

Brian listed the following meeting highlights:

- CEOS Self Study (CSS) identified three documents to be developed based on key recommendations from the Self Study: CEOS Essential Business/Core Activities, CEOS Decision Making Process, and CEOS Common Understanding of Major Meetings.
- WGClimate producing an Essential Climate Variable (ECV) inventory as a joint activity with CGMS and WMO. Agency inputs are needed. Mitch Goldberg retiring as Climate SBA lead.
- Constellations and Working Groups reported a common concern for participation from China and Russia. It needs to be communicated to them how CEOS can benefit them and why their participation is valued.
- Working Group on Capacity Building and Data Democracy (WGCapD) is developing E learning courses targeting academics. The main priority is data democracy. Secure World Foundation will fund the SRTM workshops.
- WG and VC Support from SIT and Plenary - WG and VC reports should focus on the key priorities that are ongoing or accomplished and should be of priority for CEOS Principals' discussion and (as appropriate) decision-making. While

background reporting is fine, WG and VC leads should also prepare an executive summary of each WG or VC work plan that describes the importance of the priority activities and provides a reason for executive-level CEOS meetings (Plenary and SIT) to read the document. Of particular importance are succinct requests for additional support with compelling needs and defined benefits.

- Carbon Task Force (CTF) - Planning a side meeting at AGU in December. Report should be complete by January 2013.
- GEO Task IN-01 (Earth Observations) – Focus for CEOS is the C2 Component (Space-based Observations). Priority actions include demonstration of Constellation progress (portals and data access), CBERS ground stations in Africa, ECV Inventory.
- *Ad Hoc* Space Data Coordination Group (SDCG) – Two day meeting following the SIT Workshop. The group is focused on GFOI data acquisition planning. A report is expected by SIT-28. Future role for WGISS to support data access. SDCG-3 planned for Australia in early 2013. Discussions on potential data acquisition planning to support GEOGLAM have begun, but are not the group's current priority.
- Steven Hosford (CNES) presented a proposal to have WGISS and SEO develop a set of standards for CEOS portals that might include consistent branding, client portal approaches, connections to CWIC or HMA, etc. This was first presented to WGISS in Tokyo. First need to survey the VCs to understand their status and needs. This may lead to reformulating the CEOS portals ... which will need the help of WGISS.
- CEOS Communications – SEO has purchased 5 licenses for GoToMeeting (GTM) to conduct video/audio teleconferencing to support CEOS. Contact the SEO (Brian Killough and Kim Keith) for more information and organizing your GTM. Features include 6 video windows, 75 users, VoIP and teleconference.
- Outreach – CEOS has attended GEO, COP and IGARSS. Should other meetings such as AGU, IAC, COSPAR be considered? IGARSS was a large success for COVE and CEOS. Luc Brule (CSA, Future CEOS Chair) suggested a possible CEOS session at IGARSS 2013.
- CEOS Plenary in October 24-26, 2012 in Bangalore, India. WGISS and WGCV should be thinking about key items to bring forward to the meeting for Principals' discussion, guidance, and decision-making.
- Future CEOS Leaders: 2013 CEOS Chair, Luc Brule (CSA); Nov 2013-Nov 2015 CEOS SIT Chair (CNES); 2014 CEOS Chair, EUMETSAT

Greg emphasized the role and compelling need to meet requirements, and define the benefit back to CEOS.

1.8 Summary of Previous Joint Meeting and Key WG Efforts

Greg Stensaas remarked that WGCV and WGISS have had two previous joint meetings first in Sanya in 2008, then in Montreal in 2010. The goals of these joint meetings are to identify key efforts and partners, to share common working experiences and lessons, and to define common goals and effort needed by the working groups and CEOS. The objective for this meeting is to define these areas in the WG sessions, and come back for input into joint sessions.

Greg said that WGCV / WGISS joint activities are

- Recommended Quality Assurance Framework for Earth Observation (QA4EO) Implementation in CEOS
- QA4EO related to data metadata and product harmonisation
- Incorporating quality into the community portals
- QA4EO showcases

Greg listed the previous joint meeting actions:

- Terrain elevation: Jan-Peter Muller (WGCV), Wyn Cudlip (WGISS) and Francis Lindsey (USGS) agreed to formulate a plan of action and develop a list of potential members for the terrain elevation showcase team.
- Air quality (Now using Ozone Quality): Albrecht von Bargen (WGCV) and Stefan Falke (WGISS) agreed to formulate a plan of action and develop a list of potential members to the air quality showcase team. von Bargen explained that the highlight for this showcase would be to have quality measurements.
- Forest Carbon Tracking (FCT): Greg Stensaas (WGCG), Lyn Oleson (WGISS) and Tom Holm (LSI) agreed to formulate a plan of action and develop a list of potential members to the FCT; showcase team.

Greg emphasized that CEOS joint efforts are needed more than ever, since there are over 100 EO systems on orbit, and many sensors need to be tied together via a reference standards. With so much data enhanced storage and processing leads toward integrated science products. Future satellites and constellations will continue to need system calibration and reference processes and CEOS recommends calibration, validation, interoperability, and quality information. There is strong movement at the CEOS SIT for WG and VC interaction and coordination.

1.9 IN-02-C1 Overview

Satoko Miura is PoC for task IN-02-C1in the GEO Work Plan. This task involves development of regional/global information and crosscutting datasets (including socio-economic information) and has eight priority actions:

1. Provide a suite of global datasets based on improved and validated data sources. Facilitate interoperability among data sets using the GEOSS architecture.
2. Produce a global, coordinated and integrated Digital Elevation Model (DEM), facilitating interoperability among existing Digital Elevation Model data sets.
3. Improve Global Map and foster its use across Societal Benefit Areas. Global Map datasets provide a full and consistent coverage of land on the Earth – at 1 km resolution or higher.
4. Develop a global digital geological map of the world. Make existing geological map data web accessible.
5. Use OneGeology to transfer expertise to the developing world. Develop a 3D geo information infrastructure to enhance the effectiveness of in-situ geo-scientific datasets.
6. Support the development of a global soil information system incorporating data from global, regional and national soil data projects
7. Develop a global road and human settlements map on GEO Grid. Collect, maintain, and evaluate relevant remote sensing and Geographic Information Systems data.

8. Develop systems on GEO Grid towards sharing, developing and distributing data.

Satoko stated that CEOS/WGISS is PoC of the component, and coordination is ongoing. The latest task (component) sheet is available via *http://earthobservations.org/geoss_imp.ph*. Coordination among IN-02 components and others is planned during "GEO Work Plan Symposium" week (April 30).

Satoko displayed descriptive tables of Key Outputs and Key Activities, showing description, start and end dates, and lead for Infrastructure, Institutions and Development/Capacity Building, and Social Benefits. She also reported that WGISS accomplishments include:

1-1 The CEOS WGISS Data Management Statement document (for Earth Observation Satellite Data) [1st version]

2-1 Specific, targeted white papers [1st version, for Earth observation satellite data] including the following titles:

Long-Term Archive Strategies (White Papers)
Data Preservation Techniques (White Papers)
Data Lifecycle Models and Concepts (White Papers)
Offline Media Trade Study (Reports)

1.10 QA4EO Implementation (IN-02-C1)

Gregory Stensaas presented the task tracker on the CEOS (->Actions) web page. He also gave the Quality Assurance framework for Earth Observation (QA4EO) principles:

- It is critical that data and derived products are easily accessible in an open manner and have associated with them an indicator of their quality traceable to reference standards (preferably SI) to enable users to assess its suitability for their application i.e. its "fitness for purpose".
- This Quality Indicator needs to be unequivocal in its interpretation and derivation , yet sufficiently flexible, to be implemented across the full range of EO activities which are coordinated through GEO.

Greg gave the QA4EO Principle, Quality indicator, and Traceability definitions. QA4EO implementation is supported by a framework document and a set of key guidelines to assist in its interpretation and implementation. Organizations that fund and oversee the development and execution of Earth Observation programs are responsible for implementing QA4EO principles. He also listed QA4EO events.

Greg described the QA4EO Implementation Task Force management, efforts, and members. He noted that UKSA, with Centre of Carbon Management (CCM) at the National Physical Laboratory (NPL) have agreed to support a two-year effort on QA4EO implementation by providing secretariat, web, and the leadership of Dr. Hillary Elliott. The website is http://www.npl.co.uk/carbon-measurements.

1.11 CEOS Showcase Update

Greg Stensaas gave an update on the CEOS showcases:

Forest Carbon Tracking (FCT)

WGCV is working with FCT/GFOI team to define key accomplishments and data support. In the context of FCT, resources have now been identified in the UK to support the development of a QA4EO-related case study covering optical and SAR sensors in support of a GFOI national demonstrator. This project was initiated September 5 and the team hopes to have a good analysis and case study by March/April 2013. It will require access to long time series datasets of some example sensors over a selected site in Indonesia, in particular, Landsat and Meris and ideally TerraSar.

AC/Ozone

Ozone as an example for AC is now well captured in various projects within Europe covering the quality aspects; i.e. the ESA CCI project for ozone and some development projects for the coming Sentinels. The European teams within CCI and the Sentinel development have similar work plan and project approach – the Sentinel 5 Precursor will allow carrying out some quality verifications. The latter is under guidance of several space agencies including ESA, DLR, and BIRA.

Global Elevation Global Elevation

Global ASTER DEM completed; additional efforts are being considered.

1.12 WGCV Presentation of Joint Efforts with WGISS

Greg stated that WGCV is engaged in efforts to move QA4EO forward, and engages in common efforts with other CEOS components. Greg outlined the following efforts, noting that only the top three are related to WGISS.

- QA definitions/standards
- Quality in metadata, "fit for purpose" information, accuracy, error, uncertainty, traceability
- Fields in GEO and CEOS data structure
- System specs and standards
- ECV cal/val and QA
- Carbon and climate requirements validation
- In-situ and modelling quality, uncertainty, traceability
- Other related programs and tasks
- ISO

Greg outlined QA4EO actions required of SIT and CEOS members to identify potential areas of cooperation.

Greg presented the following joint effort ideas:

1) WGCV teams should suggest ideas of quality data metadata fields for the key sensors and products.
2) Data access of CEOS Test Site information starting with CEOS IVOS sites (also test first one prior to meeting for Libya 4 site), LPV sites, SAR, DEM and others. Recommend starting with some key examples; subgroup support needed.
3) Metadata requirements for quality need to tap each WGCV working group for sensor information; have WGISS find out what is available. Get NASA ESIP feedback on this and others.

4) Quality indicators: get WGCV subrgroup support and ideas and ideas from WGISS.
5) It would be good to have input from an ECV quality perspective (Climate).
6) Identifying key partners and how they benefit the working group and they benefit from WG, working sharing experiences and lessons learned in engaging additional partners.
7) Update and develop new showcases.

Satoko suggested that WGISS discuss these topics and return to WGCV with general recommendations and participating in discussion. She added that input from climate users will be needed. Rajeev asked if ISO-19115 is part of the standard topic. Satoko said it is not specific to satellite data, but maybe the standard can be modified to fit for satellite data. Greg said agencies are expected to respond to ISO, and CEOS needs to do the same. It was noted that CEOS is creating for GCOS the environmental climate variables associated with the products, and the quality that is to be associated with it. Much discussion is expected on how to use it from an ECV perspective, and WGClimate is taking the lead on that.

1.13 CWIC Demonstration

Yonsook Enloe gave a video demonstration of CWIC. Greg remarked that CWIC will help WGCV do a lot of the things that they need to do. Yonsook recommended a discussion on how to become data partners and get access to CWIC data.

2 WGISS Plenary Session, Part I

2.1 WGISS Chair Report

Satoko Miura gave a report to WGISS on several topics, including the action to WGISS from the 25th CEOS Plenary, the CEOS Self Study, CEOS requirements to WGISS on the CEOS response to GCOS IP, Forest Carbon, and GEO Water Cycle Strategy Report. She also reported on the CEOS Portal Template, the CEOS VC wish list, the DEM Development Project, and the International Online Course which is being prepared by WGCapD.

At the 25th CEOS Plenary, WGISS was given the following action: No. 25-6: WGISS to engage related agencies and to lead an investigation into the opportunities and obstacles for the interoperability of HMA and CWIC, providing a report and recommendations to CEOS-26. WGISS continues to work with Mirko Albani on this action.

2.1.1 CEOS Self Study

Satoko reported that three new Guiding Documents will be prepared and adopted at the 2013 CEOS Plenary as a result of the CEOS Self Study. These documents are the Strategic Guidance Document (10-12 year), the CEOS Governance and Processes (5-7 year), and the Work Plan (3-year, updated annually). Three groups will also be established to prepare specific documents on Decision Making Processes, Organizations/Roles/Responsibilities (Andy Mitchell will participate from WGISS), and Meeting Purposes.

2.1.2 CEOS Response to the GCOS IP

For the CEOS response to the GCOS IP, only one action/response is related to WGISS:

> CEOS, through its Working Group on Information Systems and Services (WGISS), will coordinate space agency contributions to implementing modern distributed data services. The WGISS Technology Exploration Interest Group and CEOS WGISS Integrated Catalog (CWIC) project will work with the Parties national services and space agencies to coordinate the implementation of full information processing chain from the initial ingestion of satellite data into archives through to the incorporation of derived information into end-user applications.

WG Climate will handle all the climate related activities after the CEOS Plenary. WGISS will need to contact the Climate working group on how to move forward this action.

This action has a very large scope, and concerned was raised on the practicability of the activities involved including proprietary software. Wyn reinforced that WGISS works with interoperability between space agencies, and should be careful with the scope and discuss more specific points. Yonsook said that the WGISS strengths have been with discover/search/access, and WGISS is supporting development to support those activities.

2.1.3 Forest Carbon

The following action of interest to WGISS resulted from the recent SIT Workshop: *SDCG Co-Chairs, WGISS Chair, and SEO to confer to explore requirements and opportunities for information system for monitoring and reporting progress towards the GFOI global baseline acquisition strategy (report SIT-28 on way forward).* The potential WGISS role comes in during the acquisitions phase; being able to use a CWIC catalogue lookup to share what has been acquired in support of SDCG activities (for current planning GFOI, but also eventually maybe others like GEOGLAM).

Brian Killough asked if there is a way to discover through catalogue searches whether an image has been taken, with potential for the data access further downstream. Yonsook replied that there must be a catalogue entry, which is often done after acquisition, not before.

2.1.4 GEO Water Cycle Strategy Report

Satoko reported that the scope of the Water Cycle Strategy Report is contributions of satellite data, in-situ data, modeling capabilities and the interpretation of data to meet the needs of users. The report's governance is a writing team consisting of experts from the IGWCO COP, both research and operational space agencies and in-situ network communities, national and international programs and the broader water cycle science. The intended audience is the producers of water cycle information, stakeholders who use this information in decision making, the water cycle scientific community, CEOS and the space agencies, WMO, national agencies responsible for in-situ data, United Nations and other international water programs, and GEO members. The report is expected between January 15, 2012 and the GEO Summit in November 2013. WGISS needs to provide a volunteer for the data acquisition and distribution portions; Satoko will take the role, and the CEOS Water Portal Project will provide necessary inputs.

2.1.5 CEOS Portal Template

Satoko reported that creating this "*large database*" (for EO data) is one of the primary roles of GEO. CEOS space agencies acquire and distribute substantial amounts of data, and this work has been ongoing within CEOS (WGISS, VCs). In support of GEO (concrete progress), CEOS proposes to increase the awareness among member agencies and encourage more active contribution.

A natural tool for improving structured access to CEOS agencies' data is through the Virtual Constellations; what can be done to speed the development of access to VC data? The suggestion has been made of generating a set of requirements for VC portals (and connections to databases), and develop a Call for Proposals/Contributions to be issued by CEOS leadership to member agencies for the implementation of these requirements. The objective would be an "operational" (not 24/7) portal for each VC that provides users "seamless" access to its satellite data be established by 2015. This portal would incorporate a temporal/spatial data search capacity, visualization, link to data records and a common "look and feel"/"branding".

The VC portal Call for Proposals should include a definition of a "VC portal specification" incorporating three major aspects:

- Technical implementation of a data discovery interface and "seamless" access to data (probably in distributed databases) for each VC. This includes functional description, implementation of a data level catalogue, and access to data in distributed databases (SSO, interoperability protocol).

- Information content would include VC context and portal description, and list of missions and instruments consistent with the CEOS MIM.
- "Look and feel" would be CEOS branding

To roll this out, interaction with VC groups must occur to understand the data sources (and the agencies) that should be accessed through each VC, and to understand any issues or desires from the VC groups. WGISS and the SEO would develop a set of standards for CEOS portals that might include consistent branding, client portal approaches, connections to CWIC or HMA, etc. WGISS and SEO would carry out a gap analysis on existing VC data portals - current portal assets vs. identified standards. These gaps will become the basis for a targeted "Call for Proposals" to complete the work. The SIT leadership would implement this "Call for Contributions" during 2013 to 2015 window with the goal of achieving completion of all VC data portals by the end of 2015.

Andy said WGISS should also recommend a gap analysis of what the VCs need. Nitant asked if there is a capability to search for virtual products. Yonsook replied that only if an entry in the catalogue exists, and the metadata should indicate if it is real or virtual.

2.1.6 CEOS Virtual Constellation Wish List

Satoko reported that at the last SIT workshop, each Virtual Constellation (VC) presented their requirements as a "wish list"; for further improvements on WGISS-VC collaboration WGISS may be able to use this list.

- Atmospheric Composition: Participation from China and Russia desirable. Chinese researchers at CMA identified and contacted; Spoke with Fuxiang Huang (NSMC/CMA) at Quadrennial Ozone Symposium (Toronto, August 2012) and he will try to attend next ACC meeting. Need assistance with Russian atmospheric composition community
- Land Surface Imaging: Support from all agencies that provide land-based data and ECVs. Continued linkages to SDCG and GFOI/FCT and JECAM/GEOGLAM. Seek additional terrestrial space data provider connections through HMA and CWIC to be visible in LSI interface.
- Ocean Color Radiometry: Not aware of any Russian ocean color satellites on orbit or planned; China would be a nice addition to the OCR-VC, and data access seems to be a major issue.
- Ocean Surface Topography: CNSA/China; Agreement with SOA (State Oceanic Administration) of China approved by EUMETSAT Council in June. The aim is to have a mechanism in place for access by SOA of EUMETSAT data and products and by EUMETSAT of SOA Data and Products including those generated by the HY-2A satellite. Agencies that fly "complementary missions" that are not presently formal members.
- Ocean Surface Vector Wind: Engagement with SOA and CMA (China), and ROSHYDROMET and ROSKOSMOS (Russia). EUMETSAT recently signed a cooperation agreement with the China State Oceanographic Administration.
- Precipitation: Engagement with CMA (China) and ROSHYDROMET (Russia).
- Sea Surface Temperature: Participation needed from ISRO, KARI, SOA and CMA, CONAE, and ROSKOSMOS. (Not from wish list, but reported by SST).

Satoko noted that the following VCs need China data access, and wondered if WGISS can assist with this through CWIC: Atmospheric Composition, OCR, OST, and OSVW. She welcomed discussion on other possibilities for WGISS support to VCs.

2.1.7 Discussion

Satoko led the following discussion:

1. Response to GCOS IP: Discussion centered on the response statement that was presented. One thought was to add VCs, and to clarify what WGISS can and would do. Karen said the Climate working group did create an architecture document which might have insights into what WGISS can look at. Andy suggested that other contributors could be added such as other working groups. Michael Burnett wondered what they meant by full processing chain. The response was modified to:

   > CEOS, through its working groups and virtual constellations can contribute to this action. WGISS will coordinate space agency contributions to implementing modern distributed data services.

2. WGISS to support VCs: Michael repeated that the VCs need to communicate what their data needs are. WGISS can offer to pursue this more directly; John and Andy agreed to contact each VC on their needs.
3. Conference with WGCapD: It was agreed to coordinate with Hilcea Ferreira, WGCapD Chair to have a teleconference on Thursday (around 17:00). Discussion will continue based on the teleconference results. The possibility of having a joint WGISS-WGCapD during the week of WGISS-35 will be discussed also.

Andy suggested a WGISS poster for the CEOS booth.

2.2 SEO Report

Brian Killough reported on two CEOS studies: the Data Policy Study, and the GCI Registration Study.

2.2.1 Data Policy Study

CEOS action ID-01-C1_1 (due 31-Oct-2012) is to conduct an assessment of data sharing policies for current CEOS missions to determine the nature of any restrictions. Data Access Categories are

Open -- No restrictions other than simple registration (< 2 days).
Restricted -- Some restrictions to data access including data fees or a proposal process.
No access -- Data not available for public access and/or no public access source found.

The first release of this study (Phase-1) was completed on August 30. Next steps include a review of the results with SIT and WGISS, with final report by the CEOS Plenary. The work with WGISS will define the way forward for 2013.

The study considered current mission-instrument combinations (257) out of 100 CEOS missions from the 2012 MIM database. Data policies were based on the "majority" of data products from any mission-instrument combination and may not reflect the same data policy for all data products. Data Distribution policies were not examined in the study. It is anticipated that some distribution restrictions may exist for products that are OPEN data access. Crediting or referencing the source would be a minor restriction in distribution. Laser reflectors, data

collection systems, and search and rescue instruments (52) were not considered since they are not typical Earth science. Decommissioned missions (9) were removed (i.e., Envisat, DMSP-F14, GOES-11, SORCE).

The study found that 76% mission-instrument combinations have Open Data Access, 15% have Restricted Data Access (8% fee, 4% unknown, 3% proposals), and 9% have No Data Access. Brian listed the "No Data Access" findings.

Andy commented that the fee issue may be misleading – some agencies have reproduction fees. Brian said he would confirm the distinction. Wyn asked if they had correlated it with the EO Handbook. Brian said that the EO Handbook was used as the starting point, and that all this information goes back into the Handbook. Nitant asked if there is a category about how the data is available (internet or media). He added that the IMS-1 (ISRO) will be available in one week, and they are working on creating IDN records for them. Brian said the amount of data in the IDN is huge and the IDN is the CEOS-endorsed place. Martin requested a demonstration on the BUVAN, which Nitant gave.

2.2.2 GCI Registration Study

CEOS action IN-05-C1_1, (due 31-Oct-2012) is to conduct an assessment of CEOS data registration in the GCI to support the GEOSS architecture and interoperability principles; consider Data-CORE, Data Portals and Broker Services (CWIC). Brian defined GEOSS Data Collection of Open Resources for Everyone (DataCORE) as a pool of datasets, contributed by the GEO community on the basis of full and open exchange (at no more than the cost of reproduction and distribution) and unrestricted access. Client portals are search /access tools that connect users to data collections and products. The CEOS WGISS Integrated Catalog (CWIC) provides an interface between client portals and partner data servers.

The first release of this study (Phase-1) was completed on August 30. Next steps include a review of the results with SIT and WGISS, with complete final report by CEOS Plenary. The work with GEO and WGISS will define the way forward for 2013.

Phase-1 results of the study of 257 current CEOS mission-instrument combinations, 35% produce datasets that are considered DataCORE, 44% have data collections that are accessible through the CEOS IDN, and 27% utilize CWIC for access to data products. The study suggested targets for these missions to be added to the IDN: Megha-Tropiques, FY-3B, HY-2A, and that these missions be targeted as CWIC partners: Megha-Tropiques, FY-3A/B, HY-2A, SAC-C/D.

Andy commented that the agencies may not want to tag their missions as DataCORE, and Yonsook pointed to the presentation in the CWIC session where FY missions will be discussed.

The study also considered client portals, which are online tools to search and access. This study found 30 different portals were used for data access. Nineteen of those portals were used for more than one mission-instrument combination. The most common portals were: CLASS, FENGYUN, EOLI, NGDC, REVERB, and PODAAC. These client portals are likely the best initial connection for users to find most Earth observation data products for a given mission-instrument. NASA is developing a new client portal, called CWIC-Start, for direct connection to the IDN and the CWIC server.

A suggestion was made to develop a page with a series of links to all the portals.

Brian reported that they have conducted multiple teleconferences with GEO representatives to discuss the GCI. He highlighted that Doug Nebert (USGS) and Mirko Albani (ESA) expressed strong support of the CEOS IDN and CWIC. There is no easy way to get a list of GCI registered components and services and that Stefano Nativi (CNR) EuroGEOSS project has created the Discovery and Access Broker (DAB). The DAB will be used by the GEO Portal to query the IDN and many other capacities (OneGeology, WMO Information System or WIS, etc). A demonstration of DAB will be presented at the GEO Plenary. It is anticipated that both CWIC and HMA are functional with the DAB by that time.

Brian reported that recent discussions and emails with Mirko Albani have uncovered some more details about GMES Services and HMA. Access to data in the GMES portal is only for GMES services approved by the EU. According to the CEOS Data Policy study, the access would be "Restricted" due to the approval process. GMES service approval by the EC requires that the user must be part of a project with an SP7 Space Theme. Access to catalogs or datasets utilizes the HMA protocol for all of the missions 40 missions and instruments using HMA; need to search by instrument to compare with data similar to the SEO data study. There are some missions that use CWIC through the IDN and HMA through GMES. Mirko believes it would be easy to have CWIC speak to HMA or CWIC to interface with HMA-based ESA system like FedEO.

Andy pointed out that just because a mission is tagged HMA does not mean that it is CEOS Open. Yonsook noted that connecting to HMA and ISRO will be a great step. Wyn asked if they went to the EOLI and Brian confirmed that they did and it distinguishes between GMES and publicly available.

Brian reported a comment from Ken Casey (NOAA) that they should distinguish between "OPEN-simple registration" and "OPEN-no registration", since interoperable data access is often interrupted by even simple registration systems so it would be good to know the differences. Ken also noted that 77% OPEN data access is misleading. Many L2 and L3 datasets are OPEN, but the L0 and/or L1 are not openly available. With a future focus on Climate Data Records and ECVs, this is important to success. Michael Morahan remarked that they are not likely to get much L0. Brian also reported a comment from Ivan Petiteville (ESA), that what is missing, in most cases, is the access to the products themselves. Yonsook commented that inventories are available through CWIC with access to data download and sometimes via a URL. Petiteville suggests more work on getting direct access to the actual data products. When the user goes to download data he is in the agency site so Ivan's point goes away once that is achieved.

Brian noted as a way forward:

- DO NOT register datasets into the GCI. Focus on expanding the content of the IDN as the main source of CEOS dataset information (via DIFs). Add tags for CWIC and DataCORE.
- Continue the development of CWIC-Start and include MIM nomenclature.
- Add MIM keywords to the IDN to support CWIC-Start queries.
- Expand the number of CWIC partners using the results of the SEO Study to target potential agencies and missions.
- Continue dialogue with GEO and its use of IDN and CWIC.
- Continue discussions with ESA about the use of HMA and integration with CWIC.
- Continue the CEOS Data Policy study ...
    - Refine and improve existing data for current missions,
    - Add new data from past missions ... could be a large number,
    - Identify the primary Client Portals for all OPEN data combinations,

- Identify the primary catalog protocols (CWIC, HMA)
- Review detailed dataset availability and registration details (per Ken Casey).

2.3 5-Year Plan

Wyn Cudlip and Michael Burnett presented the revised 5-Year Plan, which includes modifications made to the WGISS structure and organization at WGISS-33. It was agreed that WGISS-All would review the document and return comments to be incorporated and discussed during WGISS Plenary Session IV.

2.4 Future Meetings

Richard Moreno reported that planned WGISS meetings are as follows:

WGISS-35: Sao Jose dos Campos, Brazil, the week of May 6-10, 2013, hosted INPE.

WGISS-36: Frascati, Italy, the week of 16-20 September, 2013, hosted by ESA at ESRIN.

WGISS-37: Not decided.

WGISS-38: Potsdam, Germany, September-October 2014, hosted by GFZ-Potsdam.

Martin noted that reduction of the number of days for the meeting was proposed, and also a one day workshop. He suggested thinking about countries in close proximity for participation, and a joint meeting with WGCapD or LSI, since they are chaired by members of INPE.

Satoko requested discussion on how many days to plan for the next WGISS meeting, three, four, or five. Michael wondered if a decision is premature, since it is still unknown what activities will be going on, who will be participating, and what workshops or joint activities will occur. John noted that a joint meeting results in about two days of overlap, as is occurring with WGCV during this meeting and jumping from five to three days might be too much at first. Yonsook suggested leveraging expensive travel with location to invite representatives from the region to work together, to expand the work, and to forge relationships and collaborations. Andy reminded that the CWIC workshop generated a lot of interest, but for such an event planning needs to begin now. Nitant suggested reserving time for new technology trends to benefit the EO systems, and the Technology Exploration IG can provide the role there. Martin noted that WGISS will play a fundamental role in the VCs to be able to do their job. Wyn suggested a workshop in South America that would host a one day workshop to pull in different countries. The consensus was that most likely four days would be needed, plus one day a workshop.

A similar discussion followed regarding WGISS-36, and Satoko asked Richard to talk to ESA about a workshop with them. Participants with contacts with GEO should also inquire, and Yonsook can mention it at the next GCI meeting. Karen agreed to work with Disasters and risk management groups at ESA.

2.5 Session Action Items

The following actions resulted from this session:

Action WGISS-34-01: Richard Moreno to contact to ESA and INPE to consider a workshop during WGISS-35 and WGISS-36.

Action WGISS-34-02: WGISS members to dialogue with colleagues at INPE, GEO, and ESA to develop workshops or special sessions at WGISS-35 and WGISS-36. Yonsook will dialogue with CWIC and GCI, Karen Moe with SBA Disasters, John Faundeen with SDCG.

Action WGISS-34-03: John Faundeen and Andy Mitchell to contact the CEOS virtual constellations and working groups to ask what their data needs are by December 31.

3 WGISS Plenary Session, Part II

3.1 WISP

Martin Yapur described the composition of the WISP team with contact information. He stated that WGISS has been successfully using the GoToMeeting web-conferencing services and plans to continue. Martin added that WGISS has been using the NOAA license, and ought to take advantage of the license now being provided by CEOS.

Presentations for this meeting are stored on Google docs. Username: WGISS.support, password: @wg1ss34. Photos are loaded on Google photos (Picasa), with the same credentials. Martin specified the naming format to be used for presentations.

Martin reported that the WGISS mailing list' provider is now Amazon, and the WGISS website has also been restructured based on the organization outlined at WGISS-33. All interest groups and project teams are requested to keep their pages up to date.

Martin reported that following the goals and objectives identified in the Terms of Reference, WISP is supporting activities in the area of knowledge exchange. WISP seeks the support of active participants to continue managing the main content of the WGISS website, to engage with VCs and discuss potential support to encourage a more relevant presence in the CEOS website, to work with SEO on a statistical analysis of the WGISS website, and to support outreach activities across the board.

Regarding outreach, Andy suggested that WGISS offer up a poster to the SEO. Yonsook suggested also a special area on the website for papers. Martin said WISP would take this on under information exchange. Nitant suggested creating a forum to exchange ideas within the WGISS site. Martin offered to explore the possibility and if feasible to begin working on the implementation.

3.2 GA.4.Disasters Project

Karen Moe led the GA.4.Disasters session giving a status on the project. The GA.4.Disasters architecture document was completed in July 2012; it includes a 2010 document that had already been prepared. Karen reported that the WGISS GA.4.Disasters project web site has been updated, with key CEOS and GEOSS reference documents for disasters/risk management. Sergii Skakun is working on an analysis of recent efforts on understanding risk. Sensor web pilots are supporting architecture findings (Namibia flood, Caribbean disasters, and Ecuador volcanoes). Wyn Cudlip is expanding case studies including a data provider perspective. In terms of outreach, a joint GA.4.Disasters/GEO Architecture Implementation Pilot (AIP-5) was presented at IGARSS July 2012. The GA.4.Disasters abstract was accepted for presentation at AGU December 2012.

Karen displayed a chart of accomplishments and next steps of CEOS-GEO Action No. DI-01-C1_2 (Streamline and harmonize how space agencies support hazard management/response with satellite data). Karen showed some charts that were presented at the CEOS SIT meeting on the GEOSS architecture for the use of satellite data in disaster management and risk assessment.

Three pilots were briefly outlined: The Caribbean Satellite Disaster Pilot DI-01-C5_1 with a chart on the flood data in the Caribbean, indicating phase requirements, mitigation and preparedness, warning, response, and recovery categories; DI-01-C5_2 Southern African Flood and Health Pilot, and Global Volcano Pilot.

3.2.1 Status and expected outcomes from GEOSS AIP-5

John Evans gave a report on participation in GEOSS Task IN-05 Architecture Implementation Pilot (AIP-5). The AIP-5 Call for Participation was issued 28 February 2012, containing AIP-5 CFP Summary, AIP Development Process, and GEOSS AIP Architecture. The kickoff occurred May 3-4, 2012. The GEO members and participating organizations are collaboratively deploying SBA scenarios, deploying, registering, and testing services based on Interoperability Arrangements, and refining architecture; working with SIF. Karen listed the AIP-5 participants http://www.ogcnetwork.net/node/1803.

John described the target contributions by NASA for AIP-5 support, and include access to MODIS instruments' data products from Terra and Aqua. Access to Hyperion and ALI on EO-1 includes sensor planning service, radiance to reflectance conversion service, user triggered atmospheric correction web service, user triggered pan sharpening and user triggered flood classifier for ALI with output in KML tiled format. It also includes access to radar instrument on Radarsat-2 with SPS in progress for Radarsat with OpenID RESTful web service, user-triggered workflow to generate water extent map in GeoTiff and KML, conversion of water extent map into OpenStreetMap (OSM) format, automatic extraction of baseline water maps from Planet.osm, and automatic combination into combined display in OpenStreetMap format.

Other targets include storage of OSM tagged water vectors in database for customized displays, GeoTorrent upgrade to allow multiple servers to deliver data simultaneously thus improving delivery throughput, and standards recommendations in Disaster Architecture work under WGISS.

Karen showed theAIP-3 Disaster Scenario Activity Diagram describing the initiator, actuator, and data processor. The AIP Architecture focus is on the five viewpoints of the architecture, categorized by community objectives, abstract/best practices, and implementation and development. Karen gave the AIP-5 master schedule, and mentioned a joint paper that will consolidate the WGISS collaboration of AIP-5.

3.2.2 Understanding Risk with Earth Observations

Sergii Skakun presented via teleconference on topics of understanding risk with Earth Observations. He reported that an "Understanding Risk Forum" was held in Cape Town, South Africa, from July 2-6, 2012. ESA alongside the South Africa National Space Agency chaired a session on "Satellite EO and Disaster Risks". The agenda included ESA's overview of EO capabilities for DRM, Urban Risk Assessments with the use of Earth Observation, Earth Observation technologies for flood mapping and hydrological modelling in Namibia, SANSA's contributions toward disaster monitoring and assessment, and applications of Earth Observation data for disaster risk management.

Sergii displayed a diagram of EO to support the full Disaster Management Cycle, highlighting the many interdependencies, and noting that only some parts of the cycle benefit from satellite data, such as flood hazard mapping and hazard extent and probability. Satellite EO can help science and operational users in exposure/asset mapping/asset modelling and hazard mapping. For instance, scientific data to better characterize/monitor hazards, low level of sophistication but rapid information on the hazard impact, and sophisticated information on hazard/risk.

Sergii categorized the types of hazards as weather-related, geo-hazards, and technological disasters. He listed the latest Charter activations, noting that floods are one of the disasters most benefited by EO satellite data. Two flood studies are underway: Flood Risk Mapping for Namibia, and Ukraine support for Cameroon floods with Sich-2 data.

Findings from this work are:

- Crisis Response: The International Charter is growing; there are more users, there is increased performance, and rapid mapping is being adopted by civil protection agencies. Access for users should be improved – in particular in Africa (Universal Access to the International Charter).
- Risk prevention/mitigation: Capacities devoted to DRM users are established or being developed (e.g. GMES EMS, 50+ Geological Surveys are engaged via SLAs), but it is quite embryonic in Africa (varies from country to country).
- To deliver data and VA services requires to address various challenges: cost, data processing capacity, thematic knowledge, raising awareness and capacity building.
- Data and information sharing: Access to information and sharing data is an important step to reducing risk, there is a need to work with countries to enable them manage and share their data.

Sergii stated that the Ukraine Space Agency was willing to contribute, and gave the data of Sich-2 for Cameroon for this project. The space agency is not now a member of the Charter, but hopefully they will become members of the Charter soon. Karen asked if the flood map was a model product, and Sergii replied that it is image processing mapped to the flood area.

3.2.3 Architecture Document Status

John Evans presented some information on the architecture document: CEOS WGISS / GEOSS Reference Model for the Use of Satellite Data in Disaster Response and Risk Assessment. John listed the problem statement, objectives, approach, purpose, scope, and structure. John stated that the paper is currently being written, and will include sections on information content viewpoint and computation viewpoint.

John listed upcoming plans from October 2012 to June 2013. He reported that they are getting very close to Reference Model v1.0 release, after which they will be investigating architecture gaps and recommended enhancements, additional case studies, and then going into v2.0. They will be reviewing findings with the Sensor Web Workshop, and WGISS-35.

Karen noted that there is ISRO representation on disaster, and requested idea exchanges. Nitant said he has gone through the document, and would like to see a specific section on small device initiatives, how to access the data and information through these devices, and extend them to other uses. They have begun working on an event-driven architecture; ISRO would like to contribute and work jointly in evolving better event driven architecture endorsed by WGISS.

3.2.4 Data Provider Case Study

Wyn Cudlip reported that the GA.4.D Architecture Study is carrying out a number of case studies to help with the development. A questionnaire was created to help solicit information that was targeted at users, and a different questionnaire was created for data providers. He listed nine questions in the data provider questionnaire, and noted that they used the Charter Case Study cycle that outlines the different actors to map to the questionnaire.

Wyn gave an introduction to DMCii, which is a UK contributor to the CEOS Charter; it is a commercial data provider, which represents several members of the Disaster Management Constellation (DMC), and in partnership with UK Space Agency – member of the Charter Board. DMCii supplies 20m/30m resolution imagery from the DMC constellation, and provides a share of the Charter Emergency On-Call Officer (ECO). It provides one week of 24/7 cover for the ECO role every 2 to 3 months. Wyn listed the responses to the data provider questionnaire, indicating details of usage. They noted that for more extended disasters that do not qualify in the Charter definition of 'disaster' such as famine, data outside of the normal Charter service would be useful. In cases where data is beneficial beyond the normal 14-day window for Charter activation, some agencies choose to continue to provide relevant data at no cost. Their suggestions to improving the process, which are already under consideration, include:

- Universal Access Initiative - to improve the marketing of Charter availability, and allow civil protection authorities from all countries to register to become an authorized user.
- Improve overall efficiency - e.g. encourage all Charter data providers to provide immediate out-of-hours support for satellite tasking and data processing.
- Further improvements in the co-ordination of Value Adding Services. However, many of these services could be considered as being outside the scope of the Charter and could be coordinated at a higher level, such as through GEO.

In conclusion, the Disaster Charter provides good case study for Architecture Study because of well defined actors and interactions. Users of one system become information suppliers in higher level systems. There is an argument to perhaps develop a hierarchical architecture.

Vijaya Banu suggested that the information going out could be more efficient in parallel dissemination instead of sequential via the three actors: On-duty operator, emergency on-call officer, and the members.

It was noted that the Disaster Charter already has a catalog, and it is desirable to allow systematic access to the data. Nitant suggested that the Charter should go one step further and archive the data so researchers can use the data. Once a disaster is over, people in risk management can use this data to see if they can recreate new risk zones, and this data can go into the risk management lifecycle. There is a lot of potential use for this data. Nitant said having a catalog only does satisfy the requirements except in the cases where the user cannot retain the data. The IDN team could investigate how to create DIFs for a disaster data repository. Some groups have started to put disaster collections into the IDN separated by sensor.

3.2.5 Practitioner Case Studies

John Evans noted that they have studied disaster response scenarios and lessons during the Sichuan / Wenchuan earthquake 2008, the Tōhoku / Sendai earthquake and tsunami of 2011, and Thailand monsoon floods of 2011. They have also worked on technology pilots such as the Namibia flood sensor web/dashboard, the NASU/NSAU Wide Area Grid Testbed for Flood Monitoring, the Caribbean disasters task for CEOS, the Thailand wildfire sensor web, and the Virtual Mission Operation Center support to USGS HDDS. Their experiences with the International Charter include a USGS member view, a NOAA member view, a UK commercial provider view, a NASA EO-1 provider view, a Namibia end user view, and Japan earthquake data for E-DECIDER. He listed other data brokers, such as Disaster Management Constellation (DMC), Sentinel Asia for Environment (SAFE), and GEONETCAST. Value added services/decision support are NASA SERVIR, Earthquake Data Enhanced Cyberinfrastructure for Disaster Evaluation and Response (E-DECIDER), NASA Land Atmosphere

Near real-time Capability for EOS (LANCE), Service Régional de Traitement d'Image et de Télédétection (SERTIT)/U. Strasbourg, EU Global Monitoring for Environment and Security (GMES) Emergency Response, EU ORCHESTRA project, and UN Platform for Space-based Information for Disaster Management and Emergency Response (SPIDER).

John listed the questions in the Case Study questionnaire. He also described in more detail the Wenchuan/Sichuan earthquake of 2008 and the 2011 Namibia Flood Pilot case studies. He displayed a chart of cross-case comparisons between the disasters in Namibia, China, and Japan, showing the participants, information providers, information used, information processing, and recommendations. John explained two additional case studies: USGS participation in the International Charter and case study, and NASA providing data to Disaster Response efforts. He mentioned a link to a document produced by Japan on the earthquake/tsunami.

3.2.6 Preliminary Recommendations to CEOS

John Evans presented preliminary recommendations for the use of satellite data in disaster and risk management:

- International Charter-like coordination/brokering mechanisms for other phases of the disaster lifecycle (warning, recovery, and mitigation).
- Allow broader data access/data sharing.
- Services infrastructure to streamline access, with near-real-time services, and on-demand, user-customizable products.
- Open, well-defined interfaces for data access, data processing/interpretation, predictive modelling, and sensor tasking.
- Different data for different users: PDFs and JPEGs, quantitative data grids.
- Metadata describing fitness for use is crucial: operational decisions require knowing data quality and cannot just filter out all imperfect data.
- Collaboration, not just dissemination: providers, co-analysts, end users not always disjoint sets.
- Frequent, high-resolution satellite observations.

Sergii noted that in the area of GEOSS infrastructure metadata and quality information be added, as well as standardization and quality assessment, many people produce flood extent with different legends and metadata. He was asked if they foresee a need for a special class of attributes. Karen suggested that a two-step process would begin with comparing the general quality metadata to user needs. Michael added that he foresees that disasters may have a specific application to the quality parameters, and they should have an input into the characterization of those parameters. The workflow needs to be pre-determined, and the question is how many workflows will be needed for different types of disasters, leading to different thresholds on different quality parameters. Sergii said they are considering the GeoViQua project for their communications the GEO portal GEOSS registry. This work is in progress in GEO – but need to develop the matrix, to provide for inclusion. Kevin noted they want it quickly, consistently, but especially they want it where they look for the information – where it is accessible to the end user needs. Karen reiterated the need for a two-step process – a preliminary discovery phase, a new user discovering the data products that work, and setting up workflows. They are hoping they can develop an example of this in Caribbean Pilot. The second phase is operational, where in real time the results of the first phase are applied. Wyn agreed pilot to begin to understand, then operational is a major step to make it part of the normal workflow, and requires a long-term commitment.

3.2.7 Next Steps

Karen noted that metadata is going to be a key component in exploring the VCs and the data they are producing from the point of view of disaster products. Next steps for the project are to continue refinements of GA.4.Disasters architecture document, with follow up analysis of case studies, extracting lessons learned, best practices and recommendations, reaching out to Disaster Management communities, and providing an article to the CEOS newsletter. They will also contribute to the GEO Architecture Implementation Pilot (AIP-5), and reach out to Disaster Management communities for feedback on GA.4.Disasters architecture findings and recommendations at the American Geophysical Union Dec 2012 session, the ESIP Federation Winter Meeting Jan 2013, and a proposed IGARSS 2013 session. They also plan to collaborate with CEOS Disasters SBA on a suggested joint CEOS /GEO workshop on disasters/risk management.

Karen reported that the GEOSS Sensor Web Workshop that WGISS agreed to sponsor at WGISS-31will have a strong focus on satellite use in sensor webs. NASA and NOAA agreed to host it in the US, but it has been delayed. The Sensor Web Interest Group was to develop a draft agenda, with input from other WGISS interest groups to identify sensor web challenges involving satellite inputs. It will feature disaster management, agriculture, and other SBA themes.

Satoko pointed out that in the Charter, it would be helpful to know if it is a major or minor disaster. Maybe the GEOSS DataCORE could provide a good linkage for disaster management. Perhaps it would be helpful to work with WGCapD on capacity building of end users. Nitant suggested that the data that are not restricted be collected into a repository for it. Karen said recent work by super-sites are includes getting agreement to store data for specific uses; perhaps there could be an analogous process for disasters. Wyn suggested approaching the Charter asking them to release the data, or the reference to the metadata.

3.3 Water Portal Project

Atsushi Kawai reported on the Water Portal Project activities since WGISS-33. The portal is adding two new data partners: In-situ data GEMS/Water-WFS interface and Deltares- OPeNDAP interface. They continue to solicit new partners (candidates include IGWCO and WGISS participants). Planned enhancements are a registration service use-case, and for outreach, they have introduced in the GEWEX Newsletter (May 2012). Atsushi displayed the goals of the portal in diagram form, and listed the features of the portal and the data partners and variables. He also listed the project milestones, leading toward an operational system in 2016. The portal can be found at http://waterportal.ceos.org/.

Nitant observed that he tried to register and got a user name and password right away. He asked if there is a user authentication process for data access. Atsushi replied that currently no, but they are aware that potential data partners need user authentication in letting users access their data so they are planning an authentication feature. Vijaya Banu noted that ISRO has a water portal system that provides data regarding Indian water resources (India-WRIS WebGIS). She suggested linking related sites to each of their portals. Wyn asked if there are any license limitations with the data. Satoko replied that next year they want to improve user authentication so they understand the users and can negotiate licensing with the providers.

3.4 Data Stewardship Interest Group

John Faundeen introduced the Data Stewardship Interest Group report.

3.4.1 Archive Environmental Data Logger Network Update

John reported the data logger collection statistics:

Participants	Data Points	Record Began
CCRS	+18,000	Aug 2011
INPE	+16,000	Aug 2011
NOAA (2)	+18,000	Feb 2012
CEODE(2)	+ 8,000	Jun 2012
UKSA	-	-
USGS (11)	+410,000	Jan 2010

3.4.2 Purge Alert Update

John reported the most recent purge alert, issued May 17 for an aerial collection of 175 15-inch by 15-inch enlargements of Maverick County, Texas, 1969. John also reported that the American Society of Photogrammetry and Remote Sensing expressed interest in the purge alert approach.

3.4.3 Data Browse Statement

John displayed the browse data statement that WGISS has developed:

> *The Committee on Earth Observation Satellite (CEOS) Working Group on Information Systems and Services (WGISS) endorses the concept of space agencies providing easy to access, geolocated browse/preview/quicklook images in common formats. These images should be at low to no cost to the user.*

Nitant suggested qualifying the statement, and John said they are avoiding getting too specific in order to finalize the agreement. John asked for acceptance and guidance to follow the approval process. It is timely for WGISS to have this as a common principle. The statement was modified to the following:

> *The Committee on Earth Observation Satellite (CEOS) Working Group on Information Systems and Services (WGISS) endorses the concept of space agencies providing easy to access, geolocated browse/preview/quicklook images using community-accepted formats. These images should be at low to no cost to the user.*

John agreed to send the browse statement to Satoko for final distribution and approval.

3.4.4 Browse Guidelines Document

Yoshiyuki Kudo noted that at WGISS-33 the interest group proposed a "Browse Guidelines Document, 1999" revision. The revision's main focus was on "Browse as a decision process." The browse specifications have been laid out across agencies. Yoshiyuki proposed new elements in the revised guidelines document including browse definition, browse towards GIS-ready, update browse availability/specifications for each organization, browse for geophysical parameters, and USGS browse documents (issued: 2001, 2004, 2008, 2009). An ad-hoc team has formed for the revision work and a number of sections are complete. Newly introduced items in the document are browse definition, recommendations for GIS-ready browse such as RGB True Color, consistent stretches to allow for comparison of images, and geolocated and map projectable in one of several listed formats. Another new item is browse for CWIC which needs to be online-accessible, and browse URL in an appropriate XML element in CSW GetRecords response (ISO19115/19139 metadata). Yoshiyuki stated that remaining work includes a survey across organizations, including LANDSAT Browse and Geophysical parameters Browse. Review of the document is needed by DSIG, CWIC, and WGISS.

Yoshiyuki said that in the current revision, USGS started to provide full-resolution browse, higher resolutions, and browse shown as an overlay on a base map. The team issued a call for contribution, inviting agencies to provide their browse specifications by December 10, 2012. The browse Guidelines Document will be a living document.

Yonsook wondered if there is any way to fit another browse system, the WMS, in the guidelines, since it is widely used. Yoshiyuki replied that WMS is mentioned in the document. Vijaya Banu suggested that interoperability should be the focus, and Nitant added that reference to HDF should also be included. Richard noted that the WMS will be the browse in the future, and that is a significant change – from table format to images superposed on a map. Yoshiyuki agreed that his team will try to give more emphasis to WMS in the revision.

3.4.5 GSCB Long Term Data Preservation Working Group Activities

Richard Moreno gave a Ground Segment Coordination Body (GSCB) Long Term Data Preservation (LTDP) Working Group Activities on behalf of Mirko Albani. He described the GSCB, which is chaired by ESA to coordinate European National, Canadian and ESA Payload Data Ground Segment activities, standards, technologies and operations, and coordination of the homogenous access to EO data from various different European missions. He listed the GSCB members and their working practices, and output.

Richard discussed ESA's coordination of LTDP activities in Europe through the LTDP working group formed within GSCB. The basic rules of the European LTDP framework on EO can be found in "*LTDP Common Guidelines and Preserved Data Set Content."* The scope of the guidelines represents the planning and implementation steps of a flow of preservation actions described in the document and derived from OAIS and Preservation Best Practices. He further stated that it is fundamental to preserve EO space data, and the recommendation to EO space data holders and archive owners, is to follow a step-wise approach starting with a partial adherence with and full adherence to be pursued in the long term. It should be planned in advance for future missions, and provides partial compliance with ISO/RAC metrics for trustworthy repositories (comparison analysis available). LTDP includes archiving, processing, access and exploitation of the archived data, and is structured as a set of eight main "themes" consisting of "guiding principles" and a set of "key guidelines," which Richard listed.

Richard reported that other activities include defining the initial data set to be preserved, including the related glossary, and work is ongoing on LTDP User Requirements Study (FIRST), Future Archive Technology Study (LAST), LTDP Initiatives and Standards Survey,

LTDP/QA4EO Study, and LTDP Architecture Definition Project. New activities planned in 2013 are persistent identifiers use in EO Data, and common procedures for L0 data consolidation and media transcription. The institutional website is http://earth.esa.int/gscb/ltdp/.

The objectives of the Science Data Infrastructure for Preservation – Earth Science (SCIDIP-ES Project) are to deliver generic sustained services for long-term preservation and usability as part of the data infrastructure for e-Science, and to harmonize data preservation policies, approaches and tools in the Earth Science Domain. SCIDIP-ES is facilitating data owners in implementing their data preservation activities, allowing what is unfamiliar and unusable to become familiar and usable, and increasing interoperability within Earth Science data domains and among different disciplines outside Earth Science.

Activities in ES harmonization include ES data preservation policies survey and harmonization, ES metadata, semantics and ontologies survey and harmonization, ES technology survey and ES infrastructure gap analysis and consolidation of interoperability aspects, and definition of an ES LTDP framework governance model and architecture.

Richard concluded that the needs and challenges related to LTDP of EO data are well identified, and cooperation in Europe in the EO LTDP domain is producing remarkable results. Closer cooperation is needed with CEOS WGISS DSIG; this can be accomplished through the GEO IN-02 task. The LTDP Guidelines and PDSC documents have been circulated to the DSIG for review, and further joint activities are to be identified. Richard presented a video on LTDP.

Satoko commented that, as they go into their next program (2013-20xx), ESA will seek opportunities to collaborate with WGISS, and more information will be available at WGISS-35. John noted that DSIG has contributed to LTDP already, and some of the portions of the document came from DSIG. Costas added that the guidelines are very specific.

3.5 Virtual Constellations Interest Group

John Faundeen agreed to lead the Virtual Constellations Interest Group. His plan is to get members of the VCs to attend WGISS meetings, speak via GoToMeeting, or to provide John with a report to present at WGISS meetings. Yonsook suggested capitalizing on the location of each meeting, since the goal is to begin to engage with the VCs, adding that Brian Killough and Kerry Sawyer are good resources in developing these relationships. Satoko thanked John for stepping up to lead.

Nitant inquired on the process define a new virtual constellation. ISRO is interested in developing VMet, a VC with meteorological emphasis, with an aim to produce global near real-time images from weather satellites. John replied that CEOS is working on a template model that would go to the CEOS Plenary for approval.

John gave the following reports on the virtual constellations and related groups:

- Land Surface Imaging (LSI): John reported that Co-Chairs are Julio Dalge, INPE, P. G. Diwakar, ISRO, and John Faundeen, USGS. The LSI VC was initiated in 2007 to facilitate optical and SAR missions related to land. Initially this group stepped back from SAR, and focused on Mid-Resolution Optical Guidelines through major efforts provided by the SEO and are facilitating the GEO Forest Carbon Tracking Project. In 2012 the LSI is refocusing with inclusion of SAR, addressing CSS and SEO Study Recommendations, seeking useful interactions with SDCG, WGCV, and WGClimate. They are also pursuing LSI Explorer (via CWIC) for terrestrial data discovery and data delivery.
- Forest Carbon Tracking (FCT): John reported that FCT is a GEO Task with goals to demonstrate that coordinated Earth observations, validated by in-situ measurements and properly linked to forest models, can provide reliable information of suitable consistency, accuracy and continuity to support forest carbon monitoring, reporting and verification leading to eventual establishment of a network of national forest and carbon monitoring systems, and to define a set of standards and interoperability requirements and methodologies to provide the most accurate results relying on the full potential of existing observational and processing capabilities. FCT follows guidelines from the United Nations Framework Convention on Climate Change (UNFCCC).
- Global Forest Observations Initiative (GFOI): GFOI is a GEO task that is the operational extension of FCT. Observations of global forests will begin with the tropical zone. The main task is space data mission acquisition coordination.
- Space Data Coordination Group (SDCG): The SDCG was established at the 2011 CEOS Plenary as an ad-hoc group with a main charge to develop an acquisition strategy for GFOI between 2013-2018, with a timetable SIT 28. John Faundeen is a co-chair of SDCG along with Frank-Martin Seifert form ESA and Ake Rosenqvist representing NSC..
- Joint Experiment for Crop Assessment and Monitoring (JECAM): JECAM is a GEO task with the goal to reach a convergence of approaches, develop monitoring and reporting protocols and best practices for a variety of global agricultural systems. It is a prototype.
- GEO Global Agricultural Monitoring (GEOGLAM): GEOGLAM is a GEO task that is a G20 initiative, and an operational extension of JECAM with the goal to address the issue of food price volatility with the ultimate objective to improve food security. They will probably begin with wheat, rice, maize, millet, sorghum, barley. It is an ad-hoc CEOS Group with participation from CSA, NASA, USGS, ESA, JAXA, ISRO, and INPE.

Satoko commented that so far WGISS has not received any requests from JECAM or GEOGLAM.

3.6 Discussion on Joint Activities with WGCV

Satoko listed the QA4EO principles, and listed reasons why there is so much interest in data quality. But quality is perceived differently by data providers and data recipients, and there are many different qualitative and quantitative aspects of quality. There is no comprehensive framework for remote sensing level 2 and higher data quality, no preferred methodologies for solving many data quality issues. Each science team has handled quality differently. She listed again status of the three QA4EO showcases and Wyn commented on the DEM; they are planning bathymetry and tsunami modeling, but not in time for Plenary.

Satoko listed the ideas from WGCV on join efforts (Section 1.12), noting that one to four is in WGISS scope:

1. Metadata/data and quality: Technology Exploration Interest Group will take responsibility for a survey of existing quality metadata within WGISS members selected data products, and provide a report by WGISS-35.
2. Data Access to CEOS Test Sites: CWIC will support the effort of LSI to release the CEOS test sites and FCT; LSI will work on data access for the test sites. The first test site will be released in time for the CEOS Plenary; the IDN has already done its part. Andy wondered if a survey of QIs in the datasets in CWIC would be helpful. The IDN's field is free-text; the IDN is thinking about

revising that, but is seeking guidance. For example, which are approved algorithms at the directory level quality assurance. The Technology Exploration will take responsibility for the survey, and provide a report at WGISS-35.

3. Identifying Key Partners; the following VCs need China data access: Atmospheric Composition, OCR, OST, and OSVW. In order for WGISS to help them through CWIC, the first step would be to contact each VC on their needs; John Faundeen and Andy agreed to take the lead on this.
4. Showcases: WGISS may need to reconsider the purpose and objective for these showcases from the point of view of WGISS.
5. New proposals of joint efforts: Wyn noted the suggestion by DEMqis for a website where agencies and others could put their quality information; currently there is no funding.

3.7 Session Action Items

The following actions resulted from this session:

WGISS-34-4: Martin Yapur to prepare WGISS outreach materials by WGISS-35.

WGISS-34-5: Karen Moe to approach the Charter regarding a repository of Charter data and reference to un-retained data; report at WGISS-35.

WGISS-34-6: John Faundeen to send browse statement to Satoko Miura for final distribution/approval.

WGISS-34-7: Technology Exploration Interest Group will take responsibility for a survey of existing quality metadata within WGISS members selected data products, and provide a report by WGISS-35.

4 WGISS/WGCV Joint Plenary Session, Part II

4.1 Welcome

Greg and Satoko welcomed ISRO colleagues to the meeting, with a special welcome to Dr. V. K. Dadhwal, Director of NRSC. WGISS and WGCV expressed great interest in the ISRO presentations.

4.2 ISRO Presentations

ISRO gave five presentations that highlighted the efforts of the agency that are aligned to CEOS, specifically to the work of WGCV and WGISS.

4.2.1 ISRO Contributions to WGISS Activities

Nitant Dube listed the Indian EO missions, for atmosphere, meteorology, oceanography, and land applications, and highlighting two decades of EO data. He also listed the ISRO (http://www.isro.org/) data portals, which include:

India WRIS Water Resource Information System (WRIS) http://www.india-wris.nrsc.gov.in/

Land Use/Land Cover Information System http://applications.nrsc.gov.in

NNRMS: National Natural Resource Management System http://www.nnrms.gov.in/index.htm

Nitant elaborated that web based geospatial data dissemination and services are accessed from NNRMS-NRDB, Bhuvan, MOSDAC, BHOOSAMPADA, India-WRIS, infrass, Decision Support Centre, and Biodiversity Information System. Bhuvan is a one-stop versatile web based Earth Observation visualization system, with access to 3D geospatial data, rich in information on Natural Resources in the geo-spatial domain. Bhuvan has real time fusion and streaming of massive raster and feature data on the fly, and a robust API with rich capabilities to utilize in a wide range of applications and systems. It is the gateway to Indian EO data products and services, including thematic services, geo-processing, data archive, and visualization. EO data/products exceed 14 Terabytes, 3D plug-in download, 19000 users per month, and about 72000 EO image downloads since Sep 2011.

Nitant reported that the NRSC Open EO Data Archive (NOEODA), which is free after simple registration and contains

- Cartosat-1 DEM 1 arc seconds 29-Sept-2011:19794
- Resourcesat-1 Ortho AWiFS data 56 meter 29-Sept-2011:7004
- Resourcesat-1: Ortho LISS-III data 24 meter 02-Jan-2012:42676

The Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC, http://www.mosdac.gov.in), consists of satellite data and services for meteorology and ocean applications, automatic weather station data archival and dissemination, real time monitoring of cyclones, and weather forecast over India at 5Km resolution using the Weather Research and Forecasting Model. The system uses KALPANA 1, INSAT3A–CCD, INSAT3A-VHRR, ISRO AWS, OSCAT Winds, Megha-Tropiques, (soon made available), and EUMETCAST.

ISRO contribution to International Directory Network includes registration of ISRO Earth Observation resources in the IDN to make ISRO data discoverable.

ISRO contribution to Technology Exploration includes development of ISRO Earth Observation Catalogue System (IEOCS) and integrating it with CWIC. ISRO proposes to study Global Earth Observation Data Processing System (GEO-DP), a web services based software framework for carrying out user specific processing on large archives of open EO data. ISRO suggested another category to emerge – that users not only have access to data, but to also be able to process on the data provider's server. It is worth investigating how to evolve those types of data centers, and what types of applications are best suited to this environment.

ISRO contribution to Data Stewardship includes study of the report on ISRO Earth Observation Data Archives, CF (Climate and Forecast) compliant Data Products Format, and demonstration of capability to generate Quick/Browse Products as part of a study, circulating products to CEOS members for feedback.

ISRO contribution to Virtual Constellations: ISRO is proposing VMET: A Virtual Meteorological Data using Global Geo-Stationary Satellites. The idea is that data from multiple satellites to be processed on a VMET server (ADDE, THREDDS) resulting in Virtual Data Products. This capability will allow access to data to countries that do not have access to meteorological satellite data, and can be used for educational purposes. Such a constellation could also be used for planning purposes so that satellites are placed in orbit at an optimal location.

Satoko commented that this information on ISRO is very exciting to WGISS, and Yonsook added that the CWIC team id looking forward to working with ISRO. Martin added that WGISS is anticipating a fruitful partnership, and commented that what they have been doing is exceptional. Andy also remarked that their work is amazing and very exciting, and offered any help or support with IDN, or creating DIFs; the suggestion in terms of processing is exactly the type of idea that is needed for the Technology Exploration Interest Group. Greg added that this is an awesome presentation; WGCV is also interested in results of the archive study from the consideration of quality of EO data.

4.2.2 QA4EO for IRS Products

Senthil Kumar listed ISRO's Optical Sensors for Earth Observation Satellites in last 10 years, and listed the CEOS QA4EO guidelines. He listed the NRSC user requirements for national projects image standards on satellite products, detailing image resolutions, projection, image frames, and position. Senthil listed quality elements of IRS data products guidelines of ISO-19113 Quality Principles, including completeness, logical consistency, geo-positional, temporal, and thematic accuracy.

Senthil reported that at the end of the early phase of operations of each IRS mission, a products compliance report is prepared following Statistical Quality Control basis to certify Process Control of Data Processing Chain. Products are randomly chosen for various conditions and various terrain cover, and evaluated for products compliance. Anomalies are left non-correctable and the Products Disclaimers bring awareness of the issue, in case they may affect their inference.
Senthil displayed examples of reports, and discussed pre-launch calibration and post-launch cross calibration. He discussed early results of collaboration, and DOME-C CEOS site calibration. He also displayed examples of various studies, including spectral band-pass variations,

spectral variations impact, spectral biases, and a summary of cross-calibration analysis. He concluded that further experiments will be conducted to get consistent results across the CEOS sites and for temporal stability.

Greg thanked Senthil for the presentation, and look forward to ISRO's support in WGCV. Satish commented that it is the first time they have seen this put into practice and wondered if they are doing QA4EO for all missions. Senthil replied that they are doing it mainly with commercial products to ensure compliance. Nigel asked if any customers acknowledged the benefits; what feedback they receive to demonstrate the value. Nigel said one of the challenges is case studies that provide a solution; this would be nice to use as an example to showcase the benefit. Dr. Dadhwal said they are regularly putting together inter-organization teams to work together. Cross-calibration is being completed for confidence in products.

4.2.3 Site Characterization for LSI and Lunar Cal

B. Kartikeyan gave a presentation on site characterization for LSI and lunar calibration. He reported that they performed identification and characterization of radiometric sites for medium resolution optical sensors like Resourcesat-2. He graphically displayed spectral comparisons of Resourcesat-2 sensors. Field instruments are periodically calibrated using an in-house calibration facility, and a high-altitude calibration of sun photometer/ozonometer is also carried out at Mt. Abu Observatory situated at 1800 m height. He listed the identified radiometric sites, and displayed images of selected ground sites, and charts of the evolution of ground data sampling strategy, temporal stability, and spectral consistency. Summary of site characteristics: all three sites are connected by state highway the average reflectance of all three sites is above 0.3. All the sites fall under arid region of western India and hence provide ample opportunity for a calibration exercise; the sites are either salt bed or desert sand- in line with 'prime candidate earth target type'. Flat surface reflectance is within LISS3 band RSR, temporal stability <3% over measured region; and the site has a meteorological station in less than ten kilometers away.

Kartikeyan displayed edge formation and point spread function of the artificial targets, and showed the convex mirror results, and results of PSF correction.

Lunar calibration of Ocean Color Monitor-2 (OCM-2) onboard Oceansat-2 presents a challenge due to co-passengers (three sensors –OCM-2; OSCAT; ROSA). Lunar imaging was carried out, and a time line diagram of moon acquisition was displayed, along with a comparison of lunar irradiance for three separate acquisitions.

For inter-sensor cross calibration between AWiFS and LiSS3 sensors of Resourcesat-2 the methodology (AW vs. L3 X-calibration) was geo-reference AW and LiSS3 Images, extract common area, resample LiSS3 image (23.5m) to AW resolution (56m) using pixel aggregate method, and generate scatter histogram between two sensors for uniform areas.

Nigel applauded their efforts, knowing how challenging it is to do carry out this sort of cross calibration. He encouraged them to establish one of those sites as a CEOS reference site, with autonomous sensors. ISRO agreed to put together a proposal to do this and Nigel agreed to help in this case study from ISRO. Greg echoed these comments, noting that they are trying to establish additional test sites in their catalog of sites. The lunar calibration aspect is very interesting. Nigel said it would be good to add into that database the ISRO satellites with the efforts on sensor-to-sensor cross comparison.

4.2.4 Ocean Buoy for Ocean Sensors

K. N. Babu and A. K. Shukla discussed cal/val activities at ISRO for ocean, land, atmosphere, and vicarious calibration of sensors and validation of bio-geo-physical products using controlled and instrumented sites in India. They described the Kavaratti test site, sampling type and frequencies of optical and other sensors. They also described the optical buoy and observation results over the Arabian Sea compared with MONY observation over land. Vicarious calibration of OCM2 sensor was described, along with results. Lastly they detailed their data dissemination and web portal for their calibration and validation program.

Greg said this work is excellent, and would like to discuss it with them to utilize their work. Nigel asked if the portal information is available to anyone and if it could be linked to the cal/val portal, and the speaker agreed that it should be possible as all their scientific users are using it. Nigel remarked that they are always looking for complementarity; another buoy is critical to the community.

4.2.5 Cross Comparison of Meteorological Sensors

Pradeep Thapliyal discussed cross comparison of meteorological sensors. The objectives of the activities are intercalibration of satellite-measured radiances from a diverse range of satellite instruments, which is important to make the observations consistent and to produce globally homogenous products for environmental monitoring. They performed proxy radiance generation (IR Imager/Sounder) for the verification of retrieval algorithm for future satellite sensors and system definition studies.

Pradeep listed four different Indian geostationary meteorological satellites and sensors. He discussed the Kalpana satellites/sensors intercalibration procedure, and the testing with Meteosat-7, and intercalibration of Kalpana with IASI and with Aqua-AIRS for 2009. He also discussed proxy radiance generation for INSAT-3D sounder algorithm testing.

Pradeep noted that future plans include intercalibration of Kalpana/INSAT-3A TIR and WV channels for the entire period with Aqua-AIRS and Metop-IASI. The MOSDAC website will provide time series of the bias and standard deviation along with the GSICS correction coefficients. They also plan the application of proxy radiances for testing the algorithms for future satellites and system definition studies for new sensors.

Greg thanked Pradeep for the presentation, and Nigel inquired if the results of correcting bias to reference sensor are what is being used operationally, or are they using their own results and then applying the bias when linking to another sensor. Pradeep replied that the biases are not purely sensor biases; some are from over- or under-sampling. Jan Peter asked if comparable activity is occurring at the visible and IR bands. Pradeep replied that they are concentrating on the IR band, adding that due to the prelaunch calibration process the sensors are well calibrated. Greg commented to the ISRO director and staff that their presentations were very helpful to see the work of ISRO, and WGCV looks forward to much continued cooperation and work. Satoko also thanked the presenters, looking forward to continuing discussion and interaction.

4.3 Demonstrations

WGISS and WGCV gave the following demonstrations to ISRO of representative activities.

4.3.1 COVE Tool

Brian Killough demonstrated the CEOS Visualization Environment (COVE) tool. This is a browser-based system that leverages Google Earth to display satellite sensor coverage areas and to identify past and forecast coincidence scene locations for more than 90 space missions and 150 mission-instrument combinations. The NASA CEOS SEO worked with WGCV to develop the tool (www.CEOS-cove.org). CEOS international projects are using COVE include GFOI/FCT (deforestation, carbon and urbanization), GEOGLAM/JECAM (agriculture, food security), SDCG/Portals (data access, space data use), among many others.

COVE uses automated daily satellite position data from the Analytical Graphics Inc. (AGI) CelesTrak database, with capabilities for saved bookmarks and states, Google-Earth KML and Shapefile compatibility, and collaborative sessions. The output includes position, UTC time, viewing angles, solar angles, day/night, and Excel tables, and has a new Graphical Interface and website design.

Brian reported that the COVE team recently met with NASA atmospheric scientists focused on cloud modeling and products. They suggested several past and future cloud datasets, including the CERES SSF dataset (12 year, ready in Jan 2013). Data will include near-global (60S to 60N latitude), hourly, 8-km spacing cloud products up to 9 months from present. A similar "Flash Flux" product can be used for time periods from NRT to last 9 months, and AVHRR product (4-km spacing) is available back to 1978. For future forecasts, global average cloud cover can be forecasted from the NASA International Satellite Cloud Climatology Project (ISCCP) dataset (D2 product, 25 years, 280-km, and three-hour sampling, monthly averages). These overlays will be available in October 2012.

For GFOI data planning Brian gave an example of the Colombia region, using 1-day Landsat-7 coverage, and 14 days to cover Colombia (wall to wall), with an average cloudiness 24% to 91%. They concluded that, assuming 90% cloudiness in the southern region, it will take an average of 140 days (2.5 times per year) to cover Colombia with clear scenes.

Brian listed future near-term and long-term plans.

Senthil Kumar noted that for cloud cover they would like to be able to click on the map and see the probability of cloud cover, to be able to select a sensor and date, and click on the map to get cloud data. Brian replied that they are thinking of how to have some browse images that are highly utilized, but they have to balance this with efficiency so that the application allows quickly accessible data. Another option is a link for the best place to go get the data.

Given a location and three satellites, COVE will easily return information on when they will coincide. Kevin noted that COVE will be available soon as an API. It was clarified that they do not have the duty cycles for the instruments; these would be potential acquisitions. The system knows when a sensor becomes unavailable. Kevin added that they are working on the export of KML files, and on graphical export, and Mercator projection.

4.3.2 CWIC Project

Yonsook Enloe gave a brief overview of CEOS WGISS Integrated Catalog (CWIC), which serves as a community catalog of products and services of CEOS member agencies. CWIC is integrated with GEO System of Systems (GEOSS), and provides an access point for search and access of CWIC partner inventory systems. Yonsook listed current data and client partners. She also listed the CWIC team, which works together to solve common challenges for search and access, and approaches and solutions that work for CEOS agencies' operational EO systems. It is essential to consider end-to-end implications for assumptions and approaches, diversity of providers and clients, and scalability and maintainability of solutions. Yonsook listed available CWIC information and resources, and outlined the support options available to new partners.

Yonsook noted that both the IDN and CWIC are integrated with GEO, and accessed by the GEO components (Geo Web Portal, DAB, GENESI). The IDN provides collection metadata for over 21,629 data collections available to GEOSS, and that 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 1,778 (28 Aug 2012 figure) data collections with inventories, and is providing technical support for GEO component teams accessing IDN and CWIC. GEO has 8668 (as of September 4) data collections tagged as geossDataCore, and the IDN provides geossDataCore tagging for 8181 (as of September 4) US agencies and INPE data collections. The IDN staff is ready and willing to tag data collections from CEOS agencies as "geossDataCore" if requested, and tools are available to register data collections in the IDN. Yonsook displayed a diagram of the GCI architecture.

Senthil Kumar asked what the quality indicators are. Yonsook said that CWIC is counting on the agencies to provide these, and WGISS is beginning to do a study/survey of what is available in order to move forward on this issue. Nigel asked, for test sites, in principle, when one defines the latitude, longitude and date period, will it return the test site holdings – Yonsook said yes, if they are registered in the IDN.

Yonsook gave a demonstration, identifying the data collections of interest, and entering mission combinations or keywords of interest. The datasets that fulfil the criteria are returned, and all the inventories that are searchable in CWIC have to provide a data download access. CWIC has access to some in-situ data, but the focus is on the satellite data. The role of the VC portals would be to bring it together under a single banner; and Satoko mentioned that the WGISS Water Portal does include in-situ and satellite data.

Vijaya Banu commented that in GeoNetwork there is a feature that can search the data portal of ISRO. She requested to work with the CWIC team to add it as a node in the GeoNetwork node. Nigel asked if COVE and CWIC could be linked; it can be linked to the IDN to browse for products.

4.3.3 DEMqis Project

Jan Peter Muller presented DEMqis, GlobAlbedo and QAlbedo. DEMqis is the display of a simple variable: elevation/bathymetry and associated QA information per pixel, where available. The display is in-house hosted SRTM and ASTER GDEMv1,2 as WMS, and with cascade to WMS. It includes transparency to mix and match different datasets and flicker to allow two datasets to be compared, and a change of overlay priority from one dataset to another. It also includes graphical outlining of areas where artifacts have been identified, and allows descriptive information to be added to each artifact located and inserted into the PostGreSQL database. DEMqis is available at http://demqis.net.

The ESA GlobAlbedo is a project for mapping the Earth's land surface albedo for 15 years from European sensor data. The goal is the production of a 13 year record (1998-2011) of 1km Land Surface BroadBand Albedo (BBA) every 8 days and monthly from European space assets to provide an independent capability to generate this Essential Climate Variable. Input data consists of level 1b (radiometrically calibrated, satellite projection) as well as MODIS MCD43A1,2 BRDF (3/2000-3/2012). An estimated uncertainty (variance-covariance matrix) is produced for each output pixel using an optimal estimation framework. Validation of final albedo products as well as intermediate products (e.g. cloud masks, aerosol retrievals, narrow-to-broadband) is performed. GlobAlbedo products are freely available via wget/curl, http and an OGC-compliant webGIS.

Jan Peter also presented the QAlbedo showcase. Users of GCM land surface albedo (including downstream services such as fapar and eLAI) need the ability to be able to calculate "on-the-fly" albedo (as this is time/sun-angle dependent). 50Tb of global BRDF at 1km for broadband and 4Tb for 2005 only at 10 x 10km used as input both with per pixel variance-covariance matrices. Value-added services will be provided by WGISS members to include GUI front-end, WPS services to process these BRDFs given a particular time requirement into the spatio-temporal requirements of an end user, and to allow simulation of top-of-atmosphere radiance signals including interface to 3D radiative transfer model with atmospheric state (WV, aerosols, etc.)

The comment was made that this is a nice example of WGISS-WGCV cooperation, and the recommendation was made that appropriate sponsorship be obtained to continue the effort. WGISS will discuss this proposal to determine involvement, and WGCV will develop a recommendation and give feedback to WGISS.

4.3.4 Water Portal

Yoshiyuki Kudo gave a live demonstration of the CEOS Water Portal for WGCV participants. He went through the two search features, Category Search and Map Search.

Senthil noted that there were datasets from Indian stations in the demonstration. Yoshiyuki replied that they come from AWCI. India is one of the contributing countries to AWCI and a few stations are identified along an Indian river basin. Yonsook asked if the portal provides a data comparison feature. Yoshiyuki replied that yes, users can do comparison between two MOLTS datasets. It used to allow for comparison between MOLTS and in-situ data, but it is not available at this point in time due to the server configuration change at the data partner side.

4.4 WGISS/WGCV Joint Efforts

4.4.1 WGISS Response to WGCV Proposal

Satoko Miura reviewed WGCV's efforts and proposal for joint efforts. She listed the proposals made by WGCV for joint efforts. On behalf of WGISS, she proposed:

- Metadata and quality: The first step would be a survey for existing quality metadata within WGISS members products, led by the WGISS Technology Exploration Interest Group, with a report at WGISS-35 (May-2013). The next steps will be discussion at WGISS-35, and discussion with WGCV, based on the WGISS-35 results (feed-back from user side is necessary).
- Data Access for CEOS Test sites: CEOS WGISS Integrated Catalog (CWIC) will support this; data access to one test site will become available before the 2012 CEOS Plenary.
- Identifying Key Partners: Use "Wish lists" from all the Virtual Constellations (VC) as the 1st step. At the last SIT WS, each VC prepared a Wish list (section 2.1.6).
- Showcases - The situation has changed so much since the previous join meeting (in 2010): FCT/GFOI are working, SDCG, and GDEM released. WGISS suggests the need to re-consider the purposes/objectives for these showcases.
- New Proposal - DEM Quality Information System (DEMqis) to record DEM validation data (in support of exploitation of ASTER GDEM). Work on Joint WGISS/WGCV Project to create DEM Showcase for the use of QA4EO (delayed due to funding problems). Activity could be contribution to the GEO Core Dataset DEM activity. Activities delayed due to lack of funding.

4.4.2 Discussion

1) WGCV teams should also suggest ideas of quality data metadata fields for the key sensors and products. Users find uses for data beyond the original intent, but then the provider should not be responsible for providing the quality characteristics of the specific use. There are QA4EO actions required of SIT and CEOS members. For the survey, and analysis of the data and the use being placed on the data collections is suggested. The question is, should it be at the collection level (quality, fitness of purpose) or at the granule level. For end users, they are only interested at the granule level. Quality assurance of processes of the instruments themselves is valuable, but it is far removed from the quality of the observation (though it may inherit the instrument level uncertainty). Over the short term it is desirable to tackle the collection level data, as a joint effort of CEOS, and the two WGs. Greg said ultimately the groups need to work on some common definitions, beginning at the collection level, and working towards the granule level. WGISS will work on survey of QI in metadata; WGCV will work on definitions.

2) Metadata requirements for quality need to tap each WGCV working group for sensor information. Suggested that WGISS find out what is available, and get NASA ESIP feedback on this and others: ISO, 19115, 19113, 19157, 19159, IEEE, ASPRS/ISPRS, others.

3) Data access of CEOS Test Site information starting with: CEOS IVOS sites, LPV sites, SAR, DEM and others. Recommend starting with some key examples. WGCV SG support needed.

4) Quality indicators: get WGCV SG support and ideas from WGISS. Search on high level and then get more detail.

5) It would be good to have input from an ECV quality perspective (WGClimate). How does quality assurance information on ECV products get populated and stored and what documentation components are needed. This ties into the Long Term Data Preservation tasks, and recommendations of cross coordination of data quality to the long term data plan. There is a document that spells out all the requirements for different domains; this could become a guideline for the QA4EO. Depending on the algorithms the quality changes. Nigel said the aim is that a higher level product should have an indicator for the user, derived from the instrument and the processes it has gone through, and an estimate of uncertainty being introduced. All of this information should be stored with the datasets, so future users know how the product was derived. Satish wondered if under the long term data preservation the high level products are also being preserved. This depends on the agencies' determination: The

starting point is to store everything, recognizing that the process chain is kept for the purposes of reproducibility. Need to work to document this better as a recommendation.

6) Identifying key partners and how they benefit the working group and they benefit from WG. WGISS is working on sharing experiences and lessons learned and engaging additional partners. Data access is very good; data quality requirements from VC would be great suggestion. WGISS will use the wish list from the VCs, but what about ESA, IEEE, APSRS/ISPRS? It was suggested to look at all the quality related activities that are going on, and see if they are relevant to the work WGISS is doing, and then if they are, contact them for help.
7) Update and develop new showcases – there were good comments on DEM. WGISS will work with the new DEMqis.
8) Portal Quality and commonality new portals – the cal/val portal was displayed, and WGCV could use some help from WGISS.
9) Linking of CEOS tools and accessibility of tools.
10) Data accessibility and availability – topics include list per mission, data policy, calibration/validation.
11) CEOS related calendar for subgroups and other CEOS related efforts.

Nitant wondered about CEOS-endorsed software.

4.4.3 Conclusions

Satoko Miura presented the following conclusions

1. WGCV teams should also suggest ideas of quality data metadata fields for the key sensors and products.
   a. WGISS to look at quality metadata for WGISS 35, starting from collection level (led by Tech Expo IG).
   b. Common definitions on quality is needed. WGCV will work on this.
   c. Work together based on above results and prepare example(s). Show and appeal to CEOS members !
2. Metadata requirements for quality; need to tap each WGCV subgroup for sensor information. Have WGISS find out what is available. Get NASA ESIP feedback on this and others.
   a. No action
   b. WGCV and WGISS chairs will send email to WGCV/WGISS members to document all the quality related activities
   c. Nigel will provide the QA4EO secretariat contact information
3. Data access of CEOS Test Site information starting with CEOS IVOS sites, LPV sites, SAR, DEM and others.
   a. WGCV will provide necessary information to WGISS/CWIC.
   b. CEOS WGISS Integrated Catalog (CWIC) will support this.
   c. Data access to one test site will become available before the 2012 CEOS Plenary.
4. Quality indicators: get WGCV SG support and ideas and ideas from WGISS; will follow item 1.
5. How does quality assurance information on ECV products get populated and stored and what documentation components are needed.
   a. WGCV will contact WGClimate to obtain quality assurance requirements.
   b. WGISS/DSIG will contribute to this, especially regarding long term data preservation.
   c. Input to GEO WP component IN-02-C1.
6. Identify key partners and how they benefit the working group and benefit from the working groups. WGISS to use the VC Wish List, and working with WGCV, to contact each VC on their detailed/specific needs.
7. Update and develop new showcases. QAlbedo - new proposal from WGCV: WGCV will discuss existing showcases and QAlbedo and give more feedback to WGISS.
8. DEM Quality Information system (DEMqis)
   a. DEMqis WPS functions (newly proposed)
   b. On-going WGISS-WGCV joint efforts; sponsorship needed, WGISS will discuss in plenary.
9. Portal quality and commonality/new portals.
10. Linking of CEOS tools and accessibility of tools.
11. Data accessibility and availability.
12. CEOS related calendar for subgroups and other CEOS related efforts; WGCV to contact Kerry Sawyer/DCEO if SG events (and other lower level events) can be reflected into the current calendar.

5 WGISS Plenary Session, Part III

5.1 CEOS WGISS Integrated Catalog

Yonsook Enloe gave an introduction of CWIC, displaying the data discovery and access diagram.

5.1.1 CWIC Report

Noting that CWIC provides the major source of satellite data inventory search and data access in GEO, Yonsook listed the current data partners. USGS and INPE are providing access to operational databases, AOE added a 3rd data center, CRESDA, in addition to the BJ-1 and FengYun data centers. NOAA will add access to most of the data in CLASS when the new API is released in summer 2013 and NASA is working to make all EO unrestricted online satellite data accessible from CWIC. JAXA is a new data partner (prototype), and will provide search to about 200 data collections (~16 million granules); GHRSST is adding ~ 60 data collections (~2.3 million granules), and the LSI team adding is additional data to CWIC through the USGS CWIC connection.

Yonsook displayed a diagram of the CWIC architecture. She mentioned the following client partners:

- CWIC-Start – user interface client for scientists, providing collection search by GCMD keywords (mission/instrument, science,..) via the IDN CSW, and search and access to all CWIC accessible inventories via the CWIC Server.
- LSI Portal: Identifies the list of LSI datasets to search by searching the IDN (mission/instrument, science keywords) to narrow down the list of datasets to offer to users.
- CCRS Agency Client: CCRS system and CWIC connection.

The CWIC team includes the Design Team, the Server Implementation Team, the Data Partners, the Client Partners, and the IDN. They work together to solve common challenges for search and access – approaches and solutions that work for CEOS agencies' operational EO systems. End-to-end implications for assumptions and approaches, diversity of providers and clients, and scalability and maintainability of solutions need to be considered. All CWIC information and resources can be found at wgiss.ceos.org/CWIC; these include the link to the YouTube CWIC demo, How-to documents for CWIC Data Provider, CWIC Client Provider, CWIC DIF Guide, link to CWIC DIF Builder tool, links to CWIC enabled clients, links to open source CSW software (for Partners), and link to Test Environment. The CWIC email list is cwic@wgiss.ceos.org, and anyone can participate in the monthly teleconference. Yonsook listed the resources available to support new partners. Yonsook explained the GCI Integration and the GEO data collection of open resources (section 4.3.2), and displayed a diagram of the GCI architecture.

Yonsook reported, in terms of GEO, that participation in IN-03 (GEOSS Common Infrastructure) involves evolution and enhancement of the GCI and operations and maintenance of GCI components. CWIC participates in bi-weekly GEOSS Common Infrastructure (GCI) Providers teleconferences. A key enhancement is emergence of brokering services. Data Access Broker (DAB) is a major enhancement of the GCI; it is the renamed and reincarnated "EuroGEOSS Broker". Other "brokering" services are GENESI, FedEO, and CWIC. The GEO Components and Services Registry and the GEO Clearinghouse are receding. The GEO Architecture Document has a new CWIC section and introduction of IDN for data collection registration and the use of GCMD keywords. The CWIC team will work with GEO component teams (Geo Web Portal, DAB, and GENESI) to resolve any identified access issues. The GCI Providers team working on a demonstration for the November GEO Plenary meeting.

Yonsook displayed the section of the GEOSS GCI Architecture Design Document that contains CWIC and IDN. Wyn asked what for the status of the release; Yonsook was not sure but it will be soon and the important thing is that CWIC and IDN information is represented.

Yonsook listed the current status of CWIC. In terms of registering data collections in the IDN and initialize the CWIC servers, they have developed a CWIC DIF builder tool, and they have added the "Project = CWIC" tag to the CWIC collections. All CWIC DIFs are accessible in IDN TEST. CWIC DIFs will be made "private" in the IDN OPS until data provider ready to move to CWIC PRODUCTION server, and IDN staff (Michael Morahan) maintains a spreadsheet of CWIC DIFs and reports new CWIC DIFs to CWIC team weekly. There are three servers: CWIC DEV, TEST, and PRODUCTION. The Bugzilla tracking tool is installed to report and track bugs, and metrics are installed to gather information on CWIC performance. NASA augmented funding for the CWIC Server team - currently it is jointly funded by NASA and NOAA. They will publicize the metrics information; once the operational clients are there the numbers will increase. Costas added that these metrics will be very important to them. September is the first month that will have monthly metrics.

The CWIC team plans to improve the processes for adding a new dataset, a new data provider, and CWIC TEST promotion to PRODUCTION. They are also working on comprehensive test plans for CWIC servers, on seamless integration of CWIC DIFs to CWIC server, and on naming issues for accessing a federation of systems (e.g. AOE, NASA, NOAA). They are investigating pagination for uniform behavior across diverse data partners, and minimum mandatory search elements different across data providers. They are investigating 'valids' for search, and enhancing status and exception handling and user registration. They are also working on improved GEO integration – access from CWIC to key inventories accessible via the GCI (DAB), future HMA access, development of CWIC Ops Concept and Ops Plans, duplicate datasets (via different search paths in GCI), integration of data visualization and access services (WMS, WCS, OPeNDAP, subsetting, reformatting), and support for new CWIC client and data partners.

In response to the VC wish for data access for key data collections or to data from key partners, CWIC needs to work with each VC to see how CWIC and IDN can provide support for data search and data access. CWIC plans to use the future WGISS meeting locations to identify VCs, CEOS agencies, and WGs and use the WGISS meeting/workshops to exchange information and discuss future potential collaborations. Suggestions are, for May 2013 (INPE host): WGCapD, CONAE, VCs, and for September 2013 (ESA host): GCI*, VCs. Yonsook also suggested a CWIC/GCI Workshop at September 2013 WGISS meeting at ESRIN, inviting ESA GEO leads for IN-03, representatives from the DAB, Geo Portal, and GENESI (all based in Italy). Potential topics are accessing IDN and CWIC from GEO, and CWIC accessing other satellite data sources from GEO through the GCI brokering services.

5.1.2 Accessing CEOS Agency Data Using CWIC-Start Prototype

Andy Mitchell gave a presentation on accessing CEOS agency data using the CWIC-Start prototype. The rationale for the prototype is to test all functionality of the CWIC server and the IDN CSW by providing a general purpose client that allows data search and access of all CWIC enabled inventories and catalogs and to allow for uniform access to heterogeneous earth science data holdings. The early prototype used NASA's Reverb as the front end, but moved to a separate code base due to the tight coupling of ECHO and Reverb which required increased

complexity in the CSW↔ECHO translator. Work has begun on a simpler web application (using Ruby on Rails) with some minor reuse of Reverb code. Andy gave a demonstration going to https://api-test.echo.nasa.gov/cwic-start/

Nitant asked about the registration, and Yonsook said they were able to detect a CWIC user who has previously registered, and essentially go through with the request as a CWIC anonymous user. For multiple requests they are working on the shopping cart concept.

Currently, they are working to integrate GCMD Keyword Management Service (KMS) ontology into CWIC-Start to improve user search experience; the initial focus is on science keywords, platform, instrument and location GCMD CSW queryable available values. In future, they will consider CSW "GetDomain" requests to present data set specific available queryable values (data set valids), and distribute queries across multiple CWIC data providers and aggregate results.

Andy discussed filtering CWIC datasets with the IDN CSW. CSW supports discovery and retrieval of spatial data and services metadata:

- IDN CSW Service Endpoint: http://gcmdsrv.gsfc.nasa.gov/cs2w
- GetCapabilities: http://gcmdsrv.gsfc.nasa.gov/csw?service=CSW&version=2.0.2&request=GetCapabilities
- Supports GetRecords, GetRecordById
- Requires authentication by IP address for access

GetRecords always includes search for propertyName "CWIC" on field "Project" to get only CWIC-accessible datasets, and adds Boolean terms (AND/OR) to restrict results to datasets of interest. Additionally it uses wildcards to search within the GCMD keyword hierarchy. The gmd:fileIdentifier (ISO) or dc:identifier (Core) is the DIF EntryID required by CWIC for search. Sample XML queries shown. The current plan is to keep moving forward – in CWIC-Start they want to continue to expose all the functionality in CWIC.

5.1.3 INPE Partner Report

Lubia Vinhas reported (in absentia) that the PHP interface that supports the CWIC connector is being maintained by INPE. It provides access to the entire repository of CDSR. Whenever a problem occurs it is solved quickly, in communication with CWIC team.

An experiment is ongoing to provide a CSW server using the GeoNetwork package. The individual responsible for this has been in contact with Yoshiyuki for experience exchange since he is trying a similar solution. They intend to continue to work to solve the problems encountered in order to decide if they are going to make it operational.

Lubia added that she is trying to include more entries to GCMD, related to datasets other than imagery, especially for the operational programs for deforestation monitoring and fire detection. She reported difficulty in getting people to understand the data to help with science keywords. She believes that people are not aware of the GCMD, and researchers that have interesting datasets do not see clearly the advantages of publishing it in the GCMD.

She plans to review the keywords associated to the imagery datasets considering the list shared by John Faundeen and LSI.

5.1.4 AOE Status on Catalogue System Integration of China EO Data

Feng Lei gave presentation via web conference, with a general introduction of the system.

He described the main work prior to WGISS-33, which included design and development of AOE node for CWIC, adding two of the three Chinese data centers NSMC and BeiJing-1. He also listed progress since WGISS-33, with new added China Centre for Resources Satellite Data and Application. The CRESDA node is a dedicated catalogue database, updated regularly. CRESDA provides a normal web service to AOE. AOE makes a wrapper to provide CSW service and adds to CWIC.

He listed the datasets at the NSMC, Beijing-1 and CRESDA data centres. For data sharing, they have designed an order system for the AOE node, requiring user registration.

Plans for the future are to follow CWIC's development requirement to improve the system, communicate with the three data nodes and do more work on data sharing, and add more data centers to AOE node. The China National Committee for Disaster Reduction has much satellite data, and they are trying to persuade them to join in. The Electromagnetic Satellite of China will be launched in 2014, and they are willing to join CWIC then. They plan to promote CWIC in China, make more departments aware of it, make more people use it, and have it serve for application about disaster reduction or emergency.

Brian asked for a list of the mission and instrument combinations that have data access through CWIC. Communication on this will continue via email, and Yonsook confirmed that there is great interest in the data and in their work.

5.1.5 CCRS Portal and CWIC Data Partner

Patrick King presented, via web conference, a status from CCRS Portal and CWIC data partner. As background, he noted that CCRS participation in CWIC began in March 2011 with the development of a CWIC client interface within CEOCat, and GeoNetwork is now being used as a CSW server. CCRS has uploaded 38,000 Radarsat-2 scenes (out of 338,000) and is ready to release a test link to the CWIC team. CCRS will place the remaining RS-2 and the Radarsat-1 dataset (800,000 scenes) within in GeoNetwork in the near future; total scenes RS-1 and RS-2 (data granules) will be 1.18 Million. Other collections can/will be added at a later date.

CCRS' short term plan is to resolve two bugs that currently exist in GeoNetwork with temporal searches. Upon approval, they will load the entire 388K scenes, automate incremental update of scenes on a daily basis, and update the IDN entries.

The CCRS Remote Sensing Archive holds 125 terabytes of Radarsat-2 data in FRED (raw) format, representing 388,000 browse image scenes with associated metadata. As a proof of concept, CCRS now serves 38K of the 388K scenes via its GeoNetwork based CSW 2.0.2 server which can be released upon approval. The CCRS GeoNetwork portal can be found at http://ceocat.ccrs.nrcan.gc.ca/geonetwork, and is useful for testing MEF batch uploads. Patrick displayed a diagram of the CCRS CSW server architecture.

Patrick discussed simulating CWIC, describing the catalog connector, the Bourne Shell, and configuration details. He also presented the new Canadian requirements for usability and accessibility for impaired users, which is leading toward web display and navigation standardization.

Andy asked if Radarsat data will be free and open. Costas replied that the metadata and browse information/access is not restricted and that an online order link will direct the user to order the data and will provide the procurement information.

Patrick reported that they should be able to resolve the errors quickly, and are proceeding to RFP in next two months. He was asked if they have encountered the reported memory issues with GeoNetwork. He replied that they have not encountered the specific errors, but since

they are still in the process of ingesting, they may not be far enough along. Yoshiyuki asked if they have code to automate incremental update of scenes on daily basis. It is exciting to be able to report that Radarsat will be available soon.

5.1.6 LSI Portal Demonstration and Report

John Faundeen demonstrated the LSI portal, which can be accessed at http://lsiexplorer.cr.usgs.gov. He selected a geographic region, desired datasets, and the displayed the search results. He commented that this portal is a good first step, and they are going to bundle the software and make it available in 2013.

Yonsook commented that this portal is an example showing where WGISS could support community portals. Having a targeted set of requirements gives the user a much better experience, and this kind of portal will be implemented more and more. They are excited at the possibility to add ISRO datasets. Nitant asked about the agency names; they come from the IDN. The lists of data sets available in the portal are from the CWIC partners, the CWIC agencies. There is no pre-filtering in the first version, but it will be done over time.

The first iteration of the browse is not geo-located on a map, but it is desirable to provide geo-located browse. Yonsook asked if they were planning to demonstrate this at the CEOS Plenary. John replied that they may be ready to do so at the 2013 Plenary.

5.1.7 GHRSST CWIC Partner

Martin Yapur presented for Ken Casey and Yuanjie Li about GHRSST, an international organization with about 35 member organizations. He displayed an example from the NOAA National Oceanographic Data Center, describing granule level GHRSST discovery via CWIC. So far, they have evaluated the ISO metadata content based on CWIC request, set up a program to create ISO metadata for GHRSST granule level data, set up NODC's Granule level test Geoportal , tested the CSW service URL with CWIC system, and have made available about 20 products to date.

Effort continues to configure the granule level Geoportal's CSW responses (full ISO response, full/brief/summary DC responses are done; brief and summary ISO responses are on-going), and add more GHRSST and NODC other ocean data products to the CWIC and GCMD.

At SIT-27, the SST VC Implementation Plan (IP) was endorsed, leveraging GHRSST. CEOS agencies were encouraged to nominate representatives to the SST VC Team - it is hoped that CEOS can enable fuller participation in the SST-VC by CEOS members having SST capabilities/interests, and can help ensure agency commitments are sustained over time. A number of CEOS VCs are trying to emulate the SST-GHRSST relationship, leveraging VC-related international science teams. WGClimate planning to trial the ECV process with SST-VC.

Martin reported that the SST-VC Portal v1.0 is complete, and can be found at https://www.ghrsst.org/users-partners/ceos-sst-vc/ and http://www.ceos.org/sst

Martin concluded saying that sixty-one L2, L3, and L4 SST "collections" and over 2.3 million data granules are available in GHRSST. The first collections were published to the CEOS Integrated Data Network in August, with corresponding granule inventories in CEOS WGISS Integrated Catalog (CWIC). Remaining collections/granules are underway.

Andy asked if some of the GHRSST products are replicated, adding that it is important to know in cases where data is also available through the agencies.

5.1.8 JAXA Status and Experiences

Yoshiyuki Kudo listed an overview of JAXA CSW, indicating the base software, the CSW profile, and supported operations. He reported that they set up CSW with sample granule records in June, and required changes to JAXA CSW have been identified through discussions with the CWIC team. They have had good communication with INPE regarding technical issues on GeoNetwork, and 1,016,333 granule records are created in ISO 19115/19139 for ingestion and are currently being imported. Once the ingestion is done, they will become available from the CSW and CWIC TEST environment; 221 CWIC-compliant dataset DIFs created and now available from GCMD (both at test and operational GCMD). Yoshiyuki listed the DIFs and granule-level metadata.

Key findings about GeoNetwork are that it is unstable with a large number of entries (over million entries) and GeoNetwork has its own database, so the metadata has to be imported to the GeoNetwork database. Batch import is available by Admin GUI tool, but it is not so friendly with large volumes of import files; the more you have in the database, the slower the ingestion process takes.

They have also found that holding the entire copy of existing database is not efficient, and a front-end approach to the existing operational catalog would be desired (e. g. sharing sample XSL style sheet along with sample native XML metadata might help).

Richard noted that they use MDWeb at CNES for this reason. www.mdweb-project.org

The JAXA team plans to test using CWIC-Start Test by the end of October. No further granule records will be added to the JAXA Test CSW. Evaluation of the JAXA CWIC activity will take place by the end of October, including investigation on ESRI Geoportal.

Yonsook asked if the different collections are in different databases. Yoshiyuki said yes, but they are working to integrate them into a single system.

5.1.9 The New CLASS API

Martin Yapur gave an overview of the Comprehensive Large Array-data Stewardship System (CLASS), which provides archive support for NOAA's large data collections, following the Open Archival Information System Reference Model (OAIS-RM), with initial and current focus on satellite data collections. The search and order capability from web client is operational (http://www.class.noaa.gov), with access to 74 dataset families => ~550 dataset types. CLASS is to be NOAA's "archive storage" infrastructure, and data centers are to provide access services.

The current interface to CLASS is via the NOAA Enterprise Archive Access Tool (NEAAT). NEAAT was developed as a prototype API, outside of the CLASS Project, and provides access to subset of CLASS holdings (46 data families). CWIC access has been implemented and tested, and provides limited access to CLASS data and services. Continued support is in maintenance-only mode, and it serves as prototype for CWIC and CLASS, but will be replaced by a new API. The Machine-to-Machine Interface (M2M) API is being developed by the CLASS project, with a focus on access requirements of NOAA Data Centers and supported missions, capable of supporting additional access mechanisms. M2M is currently in design phase, designed as set of RESTful web services, secured using OAuth 2.0. It supports status codes and error handling, and the draft ICD that describes M2M architecture and technical trade studies has been published.

Martin added that in the near-term, CWIC will continue to access CLASS via NEAAT. In future, M2M will provide access to all relevant CLASS collections; the operational release of M2M planned for summer 2013. Mapping dataset families/types to collections will be a challenge. The CLASS project is currently in discussions with the CWIC team and welcomes CWIC input to the M2M effort.

Michael Burnett asked what NEAAT uses to talk to CLASS. Richard asked about the interface with RESTful services; Martin agreed to supply them with the information.

5.1.10 CWIC DocBuilder Demonstration

Michael Morahan demonstrated the CWIC DocBuilder, and noted that the link to the DocBuilder is on the WGISS web page. Michael added that a new feature (under template, default) is available so users can pre-register to set up templates.

Michael recommends using the DocBuilder tool when entering just a few DIFs. When there are many, he recommends providing the IDN team with a file for upload. He reported that there is a slight mismatch in the timing so if DIFs are ready before the node capability is it is necessary to hide them in the GCMD for data centers that are not quite operational.

John mentioned an INPE DIF where the name is not distinctive enough, and suggested to have discussion with WGCV. Michael agreed to contact the WGCV Chair to dialogue over naming issues of DIFs, to allow for uniqueness and clarity.

5.1.11 Outreach and Closing Remarks

Martin Yapur summarized the CWIC evolution and milestones. He concluded that with CWIC, access to data is now possible in a more harmonized way. The initial architecture of CWIC was developed, and funding was been secured. A CWIC workshop a year ago was very successful, a CWIC demonstration on YouTube is available, and data provider and user guides are on the WGISS website. The team is interacting with GEO on many levels, and working on GEOSS integration. Client partners to CWIC are integral to the success of the project. He listed all the existing partners, those that are in progress or considering joining.

Richard Moreno noted that the agency participation slide showed ESA as a potential partner, and ESA will not be a “data partner” in the sense that they will implement CWIC standards. Yonsook agreed with Richard and responded that CWIC will connect to ESA via the ESA Data Access Broker for access to ESA data.

5.2 IDN Interest Group

Michael Morahan presented current efforts of the IDN. He gave references to access MWS and KMS services and documentation.

5.2.1 Metadata Web Service

The Metadata Web Service (MWS) provides dynamic access to all GCMD metadata record types using RESTful web service structures. NASA EOSDIS/URS authentication is required for access: https://urs.eosdis.nasa.gov/. From this location it is possible to retrieve a list of all metadata documents, filtering by a query expression, a specific metadata document, using its unique identifier, unique identifiers of metadata documents, filtering by a query expression, and keywords for a specific metadata field. He listed links to MWS Query Examples, and displayed a result example.

5.2.2 Keyword Management System

The Keyword Management System (KMS) is a RESTful web service that provides dynamic access to all GCMD keyword sets in Simple Knowledge Organization System (SKOS), Resource Description Framework (RDF), Web Ontology Language (OWL), and Comma-Separated Values (CSV). NASA EOSDIS/URS authentication is required for access: https://urs.eosdis.nasa.gov/. He listed links to examples, and reported that incremental updates are now possible with KMS. Climate Indicators and Human Dimensions keywords have been revised and extended (some terms to 5-levels), and entered into the Keyword Management System (KMS); they are currently undergoing quality control, and will be available on the website, in docBuilder, and in the KMS/MWS in late fall. A release announcement will be made. Work on Solid Earth, Spectral/Engineering, Atmosphere, Paleoclimate, Biosphere, and Land Surface keywords are in progress; modifications to these keywords are being made based on community/collaborator feedback and internal review.

Michael added that enhancements will continually be made to KMS and MWS, and he requested help to improve the user experience by submitting feedback to: gsfc-gcmduso@mail.nasa.gov. He also listed procedures for accessing the IDN CSW Testing Server.

Andy asked what the process is for getting keywords added, and mapped. Michael said they should be sent directly to him. Brian Killough and Andy Mitchell agreed to work with Michael Morahan and Lola Olsen to map the GCMD keywords in the IDN.

5.2.3 Future Work

Future work includes ISO to DIF translations and ISO interoperability for docBuilder and website (draft white paper). The team will support user defined fields in metadata (track scientific and arbitrary information). For user defined UUIDs and field values, the named value pair allows users to add user defined field pairs; users can define a new field (UUID) and then assign a value for that field; the field will only show up in that particular DIF record and may or may not be exposed in the DIF display (user choice).

Planned docBuilder improvements are to create a portal of specific default templates such as customized pre-population of DIF fields, allowing for common field values to be pre-defined per portal in docBuilder, and free-text and controlled fields can be pre-defined. Portals with specific docBuilder field requirements can now validate against those required fields.

For Xpath variables in related URL: User discovers data set GES_DISC_OMDOAO3e_V003 through the GCMD interface, and wants to obtain granules for the dataset. Based on the user's GCMD spatial and temporal query, the "Related_URL/GET DATA/Reverb" is configured "on the fly" with the user's query specification using the new feature. This saves the user from having to recreate the query in the Reverb main interface. User links to Reverb by clicking "GET DATA/Reverb" link in the DIF display.

Plans for the Bulk Upload Tool, a user web-based GUI, are to validate and upload multiple records (to Queue) into the GCMD/IDN.

Support of GeossDataCore tags requirements for the IDN include capability to add GEOSS Data Core identifiers to main IDN collection metadata using the CWIC docBuilder tool; capability to query the GCMD CSW server and main IDN Collection for data sets that match the GEOSS Data Core identifiers; and synchronize IDN DIF records with the ISO records held in the IDN CSW server.

Michael listed the GeossDataCore Identifiers. Andy suggested placing the enhancements in the IDN docBuilder.

5.2.4 IDN Metrics

Michael reported the latest IDN metrics, including usage, DIF population, SERF population, climate diagnostics population, DIFs tagged with CWIC, all of which indicate increased usage and populations.

Kevin asked if he had numbers on the SERFs as well; Michael said he could provide them. Andy asked for a list of the US agencies that are not tagging their data as GeossDataCore.

5.3 Technology Exploration Interest Group

Andy Mitchell stated the purpose of the new Technology Exploration Interest Group, which is

> *to serve as a forum for exchange of technical information and lessons-learned experience about current and trending software technologies, services and other www/internet related software technologies.*

The primary goals of the Technology Exploration Interest Group are to:

- give CEOS/WGISS members opportunities to collaborate and discuss present and future technology solutions;
- to research technologies that can help the Earth observation community be flexible and adaptable in their IT infrastructure;
- help facilitate CEOS/WGISS understanding of all generations of technology and support the implementation of both legacy and leading edge technologies into Earth observation data systems;
- promote technologies in CEOS/WGISS that prove beneficial to the Earth observation community.

The interest group suggests advertising WGISS agencies' tools and services on the WGISS website, including offering a "Lessons Learned" area, and perhaps a soft "WGISS Endorsement or Technical Note." He also recommended sharing Open Source software between CEOS agencies (e.g. GEO Network, WMS).

5.3.1 Data Quality Research

The interest group has agreed to conduct a survey of existing "Collection Level" quality metadata within member agency products (what is there, not there and possibly what is missing), and will review the survey list with WGCV. They plan to begin with the most popular collections or widely distributed collections; granule level and image quality can be included later. A report will be presented at WGISS-35.

The team also plans to document the different quality activities that are happening in the community (e.g. ESIP-NASA), and list QA formats being used.

5.3.2 OGC and OpenSearch

Michael Burnett reported on OGC and OpenSearch, noting that the OGC Catalogue Working Group decided on version 3 of the CSW as the mandatory baseline for OpenSearch Interface; it contains Geospatial and Temporal Extensions, and ATOM responses. Due to interest, the OTC Technical and Planning Committee approved a "Fast Track" process for approval. OGC 10-032 is in final draft, and has been for a while, due to funding; this is anticipated to change soon.

They have voted to adopt the OGC usage of OpenSearch and ATOM output, and there has not been much activity on this since that decision. He noted that if OGC decides to adopt v3 they would probably deprecate the previous version. CWIC adopted CSW 2.0.2 because that was the GEO accepted standard.

5.3.3 User Registration and Authentication

Michael Burnett presented an update on user registration and authentication issues. It is agreed that there is a need for user registration and authentication, with the goal of getting the user closer to the right data, and at the same time allow ease of participation. CWIC partners are requesting that users be authenticated to allow for expanded range of offerings, and for tracking use of data for metrics. The challenge is to achieve agreement and allocation of responsibilities, and minimize complexity and impact on partners.

A CWIC Partner survey was conducted to assess what characterizes a "User", acknowledging that all data in CWIC is accessible at different levels and costs. Survey of nine systems found 23 separate fields, 18 of which are mandatory for at least one system; only one field is required everywhere (email address). Some semantic differences were encountered, but they seem manageable.

The following use cases were developed:

- Authenticate User
- Search for Data (authenticated user, anonymous user)
- Access Data (authenticated user, anonymous user)
- Register User

The challenges with Authenticate User are determining the mechanism for authentication, identifying provider differences, and determining what should CWIC do to facilitate. Michael listed pros and cons of several options. Authenticate User Inclination is CWIC as trusted middleware, where trust is on the part of the client, and CWIC passes through authentication information, returns authentication key received from provider, and retains no information. The client uses the authentication key. This requires users to be authenticate-able, for providers to return XML-able authentication evidence, a new CWIC service, and a new (optional?) parameter on discover and access interfaces. This authentication would only be for data access, not for catalog access.

The challenges with Register User are determining what CWIC should do to facilitate user registration, handling heterogeneous user attributes, and security concerns. Michael listed pros and cons of several options. With Register User Inclination, CWIC has no role at all. With CWIC as trusted middleware, trust is on the part of the user, CWIC passes through user attributes, CWIC returns status only, and CWIC retains no information. It requires users to know their information and where they want to register, a new CWIC service, and for providers to support a user registration service that accepts XML string, ignores non-relevant fields, and return status.

Michael suggested that discussion will continue, as will a survey of user management technologies, support for authenticated search, mechanisms for authenticated access, and impacts to development.

Finally, Michael discussed OpenID, which is decentralized authentication with reuse of third party credentials, and specified by OpenID federation (openid.net). GEO is considering this solution. Current concerns are that it requires the system owner to be an OpenID Identify Provider, it is http-based, and metrics collection.

Michael asked if WGISS member agencies are using OpenID, and if so, are they formal OpenID Identity Providers.

5.3.4 NASA's ESDS Reference Architecture

Michael Burnett reported that this project is meant to obtain a common understanding of NASA's Earth Science Data System (ESDS) using Decadal Survey Missions, taking advantage of interoperability momentum. The scope is future missions and data systems, with a lifecycle of 15 years and a target of 30-40 pages. The relevance to WGISS is the value of common understanding and language, with interoperability as a goal, and it correlates to WGISS goals as stated in the 5-Year Plan.

A Reference Architecture *"provides a template solution for an architecture for a particular domain. It also provides a common vocabulary with which to discuss implementations, often with the aim to stress commonality."(Wikipedia)*. It is an organized description of the common features and patterns, not a solution, that provides guidance (is not prescriptive), and is enabling (not specifying).

The approach is to identify Reference Architecture stakeholders, and develop use cases. Four views will be considered: functional, information, system service, and technology view. Michael listed stakeholders and use cases, and displayed diagrams of the functional, information, system service views.

Michael described an immersion exercise, listing goals and guidelines. This resulted in top priority issues being addressed, including security, real-time access, and technology view, reevaluation of context of functional view, modeling/predictions, and a common diagramming tool. Key strategic issues are retaining level of abstraction, a living document (but baseline needed), and a number of separate, but correlating papers have been identified.

This study provides the following opportunities for WGISS: To consider the applicability of a WGISS Reference Architecture, establishing scope with clear lines of responsibility and contributions, verifying current activities alignment to a Reference Architecture, and learning how to this would help WGISS partner contributions and collaborations. Another opportunity is to establish a WGISS Reference Architecture, expanding upon WGISS Domain Model work. Projects should align, CWIC and GA.4.Disasters.

The NASA ESDS Reference Architecture can be obtained at http://earthdata.nasa.gov/sites/default/files/field/document/ESDS Reference Architecture v1.1.pdf .

5.3.5 Overview of NASA EOSDIS Global Imagery Browse Services

Kevin Murphy gave an overview of the EOSDIS Global Imagery Browse Services (GIBS), which continuously generates global mosaics for 50+ products and provides full resolution imagery with global coverage in geographic and polar projections within three hours of observation for MODIS, AIRS, and OMI. Standards-based access consists of OGC Web Map Tile Service (WMTS), Google Earth KML, and tiled WMS. It is highly scalable and responsive services using Google Maps-like backend. Kevin displayed diagrams of spatial/temporal tabular search and order use cases, and visual search and order use cases, and described several use cases.

Access methods supported by GIBS include web-based, standalone and mobile clients, and script-level access. Future activities through early 2014 include concept operations refinement, architecture study, prototype integration with ECHO for product order, key based authentication, generate MODIS collection 6 browse imagery for complete record for Terra and Aqua, and add additional EODIS standard data products.

Kevin listed major development activities completed, and noted that next phase of development will concentrate on developing collaborative capabilities, improving the design and information architecture to increase usability, adding support for customization of web services by end users, implementation of an EOSDIS-wide software sharing infrastructure to foster reuse of capabilities created at DAACs. They also plan to continue to provide technical and design assistance to Data Centers and other EOSDIS components, and full integration with EOSDIS User Registration System (URS) for customization of website.

5.3.6 DEMqis Report

Wyn Cudlip reported that there is not much to discuss in the area of DEMqis, due to funding issues, but it is to be a joint activity – cooperation will be in populating the site once it is built. Wyn will be the PoC, and WGISS can support it but will wait for WGCV lead. Wyn will report further at the next WGISS meeting.

5.3.7 Next Steps

Next steps are to develop topics of interest including a Technology Showcase, agency participation (WADC follow-on), and to plan a regular meeting time. After discussion, the group agreed not to create a new mailing list for the interest group, but rather to use the WGISS-All mailing list.

5.4 Agency and Liaison Reports

The GSDI Association, and the WGCapD Working Group gave liaison reports, and NASA, JAXA, CCRS, ISRO and INPE gave agency reports.

5.4.1 WGCapD Working Group Report

Lubia, the liaison to WGCapD sent the following report.

DEM Development Project has the objective to incorporate Shuttle Radar Topography Mission 2 (SRTM 2) data into existing processes and projects, increase the ability of participants in activity to utilize 30m DEM, and increase collaboration on regional institutions with space agencies in the region. There is a workshop scheduled for November 2012 in Nairobi that may be delayed because of the political problems. For the workshop, data for South Sudan and Somalia has been released to NOAA. USGS will be the primary provider of the SRTM 2 data in this project. The data is not for the public domain only the derived products from the data. The outline of the workshop includes: NASA/SERVIR use of SRTM for improving flash flood tool based on CREST model; USGS processing of SRTM and making derivative products and INPE use of TerraHidro open source software to do analysis of the data.

WGCapD is developing an International Online Course that will grant a Professional Development Certificate (180 hours, divided in 4 modules of 45 hours each: 4 months.) The course will give an insight into remote sensing, both in theory (mathematical and physical background) and in practice (applications and training). At the end of the students will be able to understand the information content of remotely sensed data, know how to retrieve the information, and decide which remote sensing techniques suite their specific needs. There will be 20 participants from Africa and the instructors are volunteers from various agencies involved (INPE, CONAE, ISRO, CNES/IR). INPE is responsible for issuing the professional development certificates. It is scheduled to start in February 2013.

WGCapD wants to "integrate" the GeoNetCab capacity building portal (MDWeb - http://geonetcab.mdweb-project.org/search/main.jsf) in their page at the CEOS website. This portal allows users to search for "resources" such as software and data. Satoko arranged a teleconference during this meeting with Hilcea Ferreira, WGCapD Chair, to discuss this. The first thought was to add links in the WGCapD website pointing to the LSI catalog and the GCMD directory. The GeoNetCab project is in charge of developing portal. What Hilcea is seeking is to identify a way to connect the resources in the GeoNetCab portal with WGISS resources. WGISS agreed to look at the portal and make any recommendations to link the GeoNetCab portal and LSI portal and IDN.

Hilcea noted that WGCapD will have a side meeting at the CEOS plenary, and invited Satoko to join them.

Satoko asked about having a joint session during WGISS-35. Hilcea said they would be very interested. It was also suggested that other agencies in Brazil, Colombia and Argentina may be interested in a workshop. This topic will be coordinated by email and discussions at the CEOS Plenary.

5.4.2 GSDI Association Liaison Report

Gabor Remetey gave the GSDI Association liaison report by web conference. He reported on the GSDI 13 World Conference, the Meeting on Legal Interoperability, and the Meeting on Technical Interoperability. He added that GSDI will be represented at the GEO IX Plenary.

Gabor discussed the GSDI Legal and SocioEconomic Committee, the legal aspects of PSI and re-use (LAPSI), PSI Access and Reuse Dissemination activities. He listed the GSDI IGEOS, GIKNET and SDI Regional Newsletters.

In the regional outlook Gabor presented the NASA World Wind Europa Challenge, and news on EUROGI. At the national level he presented the case of Hungary from a HUNAGI perspective including lobbying activities and recent events. He also mentioned the Geocarto International Hungarian Issue December 2012, the 10th Imagery – Map Conference Gyöngyös, and contribution to ISDE's Digital Earth Vision 2020.

Gabor noted the role of liaison, which is to facilitate exchange of information in order to avoid duplications and achieving synergy. 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. Interoperability in legislation is also an issue to be addressed. The GSDI regional and national level members from all continents are contributors on continuous basis.

Satoko asked Gabor if he had any feedback from the GSDI Association. Gabor replied that the synergies and cooperation between WGISS and GSDI are valuable to both sides.

5.4.3 CCRS Agency Report

Costas Theophilos gave the CCRS agency report. He reported that the Government of Canada announced an investment for the revitalization of NRCan Satellite Station Facilities, providing coverage for North America. He also discussed the GeoConnections Project Proposal to develop and implement a state of art EO data and information management infrastructure for Long Term EO Data preservation. The project proposal requested funding for LTDP architecture and system implementation of the OAIS compliant data management system. The project outcome is to have an impact on organizational infrastructure. He also mentioned the archiving program.

From an organizational perspective, he noted the development of a Federal Committee on Geomatics, clustering with focus on cost avoidance, and new federal architecture being proposed (lead agency). CCRS is also working with the Canadian Space Agency on RCM Requirements.

5.4.4 JAXA Agency Report

Atsushi Kawai presented a report on JAXA. He reported that the SHIZUKU (GCOM-W1) was launched from the Tanegashima Space Center on May 18, 2012 and started regular observations since July 3, after increasing the antenna rotation of the onboard Advanced Microwave Scanning Radiometer 2 (AMSR2) to 40 rpm. The instrument moved to the regular observation operation on August 10.

The AMSR2 is a further improved successor of AMSR-E on Aqua, and observation for water circulation mechanisms will be possible. AMSR2 data will be available on-line free and open to users for research use, like AMSR-E. Entered into A-train orbit, and a number of early images were displayed.

Near future efforts include to continue initial Cal/Val phase for AMSR2 data. For further details, please see the following "SHIZUKU" web pages http://suzaku.eorc.jaxa.jp/GCOM_W/index.html and http://www.jaxa.jp/projects/sat/gcom_w/index_e.html.

5.4.5 NASA Agency Report

Andy Mitchell presented the NASA agency report. He discussed the Land and Atmosphere Near real-time Capability for EOS (LANCE), which is a component of EOSDIS that generates and distributes products from 5 instruments: AIRS (Aqua) and MLS (Aura), MODIS (Aqua and Terra), OMI (Aura) and AMSR-E (Aqua). He also reported on the NASA User Registration System (URS), with consolidation of similar registration systems into an EOSDIS wide user registration system for ECHO, LANCE, and GCMD/IDN DocBuilder Tool. Effort revolves around improving the user experience, standardized method of metrics collection, enabling status change notifications to users, and establishing a framework for future capabilities.

Recently, NASA and the European Space Agency entered into a data sharing agreement whereby NASA provided ESA with the full L1A data sets from the MODIS-Aqua and SeaWiFS instruments in exchange for the full MERIS L1B data, both the global reduced resolution (RR) and full resolution (FRS) data sets. Currently, the full MERIS L1B RR data set is available from the ECHO's Reverb and the Ocean Biology Processing Group. The FRS data will be available in the near future.

The Operation IceBridge mission, initiated in 2009, collects airborne remote sensing measurements to bridge the gap between NASA's Ice, Cloud and Land Elevation Satellite (ICESat) mission and the upcoming ICESat-2 mission. IceBridge mission observations and

measurements include coastal Greenland, coastal Antarctica, the Antarctic Peninsula, interior Antarctica, the southeast Alaskan glaciers, and Antarctic and Arctic sea ice.

The NASA ISO 19115 wiki released: http://earthdata.nasa.gov/wiki/main/index.php/ISO_19115_Home**.** A graphic of EOSDIS metrics was shown.

5.4.6 ISRO Agency Report

Arulraj demonstrated the Bhuvan portal. Bhuvan is a GEO-portal of ISRO showcasing Indian Earth Observation Capabilities through online rendering of multi-sensor, multi-resolution and multi-temporal IRS imagery overlaying value added thematic information on Earth Browser, providing satellite data and products for download and consume thematic datasets as OGC web services towards online geoprocessing, whilst serving for societal good.

Plans are underway to work with CWIC so that Bhuvan inventories can be accessed.

5.4.7 INPE Agency Report

Lubia Vinhas provided an INPE report. She noted that INPE has a new director, Dr. Leonel Perondi. He has been working at INPE since 1982, and acted as General Coordinator of Space Engineering and Technology from 2002 to 2004, CBERS Program Manager from 2002 to 2005, and deputy Director between 2001 and 2005.

INPE Remote Sensing Data Center continues to receive and process Aqua 1, Terra 1 and ResourceSat-1. Since the last meeting (May 1 to today) 17299 new scenes were processed and feed to the repository and 155797 scenes were delivered to users (66% in less than four minutes). She noted that the CBERS 3 launch is delayed, due to a technical problem, until at least to February 2013. CDSR is prepared to receive and distribute CBERS 3 data.

5.5 Session Action Items

The following actions resulted from this session:

WGISS-34-8: Michael Morahan and John Faundeen to contact WGCV Chair to dialogue over naming issues of DIFs, to allow for uniqueness and clarity.

WGISS-34-9: Brian Killough and Andy Mitchell to work with Michael Morahan and Lola Olsen to map the MIM keywords into the GCMD.

WGISS-34-10: IDN to review the GEONETCAP Portal and suggest where it should be linked in time for the CEOS Plenary.

6 WGISS Plenary Session, Part IV

6.1 5-Year Plan Discussion

Michelle Piepgrass initiated a discussion of the revised 5-Year Plan, noting that she incorporated all the suggested modifications, and that a number of comments should be discussed:

1. Should information that changes annually or semi-annually (such as structure) be moved to the annex? It was agreed that it would be unnecessary since the plan is revised every two years.
2. Should WISP and IDN be listed as interest groups or projects? WISP and IDN are projects with no specific end. Martin suggested moving WISP over to the responsibilities of the secretariat, and the IDN could be a supporting activity to CWIC but not a project of its own. Another suggestion was to make two special projects that are continuous, or move them under infrastructure. Ultimately it was decided to create a separate box in the structure diagram called Infrastructure Activities, and place WISP and IDN in the box.
3. Should the CEOS working groups be listed under liaisons? Given the need to closely coordinate WGISS activities with other organizations, Liaison Points of Contact are identified from within WGISS members to provide an interface to these external organizations and to report to WGISS. Martin noted that the review of member lists should come at about the same time as the review of the organization chart. All members have to be direct sponsorship of active CEOS agency.
4. What is the character and purpose of the 5-year plan? Richard commented that the 5-Year Plan is fairly generic with content that is unchanging – he wondered what can be done to make it more attractive. It is a governance model of WGISS, and has to be in line with GEO and CEOS. The annex needs to have specific goals targets, and tangible and measurable outcomes. The vision of the chair is also included in the annex. From the 5-Year Plan WGISS can adapt to the CEOS' document requirements when released. Satoko suggested waiting till the CEOS plan for documents is released, so this document is an interim change. At the next stage this document can be split into a governance document, and a more focused and technical document.

It was suggested that at WGISS-35 to have a session to develop the WGISS strategy, brainstorming on ideas of big targets, goals, and measureable tangible outcomes. The plan was accepted subject to the above revisions, to be submitted at the CEOS Plenary.

6.2 WGISS Summary

Satoko listed highlights of the WGISS-34 Plenary:

- VC IG Lead identified, thanks to John Faundeen, USGS.
- Joint Efforts with WGCV in the areas of quality information in metadata, data access of CEOS test sites, identifying key data partners, long term data preservation of ECVs, and DEMqis (funding to be secured).
- Collaboration with VCs – agreed to contact to each VC on their needs.
- Joint efforts with WGCapD include a potential link between GeoNetCab portal and IDN, starting with "from GeoNetCab to IDN", link from GeoNetCab to LSI Portal, and planned joint session during WGISS-35.
- Contributions to CEOS – prepared a CEOS response to the GCOS IP; will wait for the next phase of SDCG, and will participate in the GEOSS Water Strategic Report preparation.
- WGISS 5-Year Plan: Finalized

WGISS reworded the CEOS Response to GCOS IP (see below). Satoko sent the revision to CEOS, but CEOS had already submitted their response. WGISS will be able to coordinate with Climate WG and identify more specific WGISS actions after 2012 CEOS Plenary.

> *CEOS, through its Working Group on Information Systems and Services (WGISS), will coordinate space agency contributions to implementing modern distributed data services. The WGISS Technology Exploration Interest Group and CEOS WGISS Integrated Catalog (CWIC) project will work with the Parties national services and space agencies to coordinate the implementation of full information processing chain from the initial ingestion of satellite data into archives through to the incorporation of derived information into end-user applications.*

Planning for WGISS-35 resulted in agreement for a three to 3.5 days for the WGISS Plenary, and one to 1.5 days for a joint session with WGCapD and a regional workshop.

Satoko will prepare a presentation for WGISS to the CEOS Plenary, and noted that the agenda time for this session may be reduced by 5 or 10 minutes. The presentation should be 11 to 12 slides. She suggests two slides for WGISS structure, participation status and WISP, one for CEOS Requirements/Requests to WGISS, two for the WGISS 5-Year Plan, and two for joint efforts proposal (WGISS and WGCV/VC/others). Two to four slides will cover highlights of IDN, CWIC, Technology Exploration, DSIG, GA.4.Disasters, and Water Portal. Martin suggested an inclusion of the Virtual Constellation group – Satoko preferred to include it in the joint efforts slides.

Satoko requested that interest group and project leads provide her with the slides for the above, and that they update their pages on the WGISS website before the CEOS Plenary (Oct. 24-26). She also requested that feedback on the COVE Tool be given to Brian as soon as possible.

6.3 WGISS-34 Actions

Michelle Piepgrass reported that all actions from WGISS-33 are closed.

Listed are the actions resulting for WGISS-34:

Action Number	Action Description	Actionee	Due Date
WGISS-34-1	Richard Moreno to contact to ESA to consider the agenda of sessions with ESA during WGISS-36.	Richard Moreno	WGISS-35

WGISS-34-2	WGISS members to dialogue with colleagues at INPE, GEO, and ESA to develop workshops or special sessions at WGISS-35 and WGISS-36. Yonsook Enloe will dialogue with CWIC and GCI, Karen Moe with SBA Disasters, John Faundeen with SDCG.	Yonsook Enloe, Karen Moe, John Faundeen	WGISS-35
WGISS-34-3	John Faundeen and Andy Mitchell to contact the CEOS virtual constellations and working groups to ask what their data and portal needs are, and coordinate with Stephen Hosford, by December 31.	John Faundeen, Andy Mitchell	31-Dec-12
WGISS-34-4	Martin Yapur to prepare WGISS outreach materials by WGISS-35.	Martin Yapur	WGISS-35
WGISS-34-5	Karen Moe to approach the Charter regarding a repository of Charter data and reference to un-retained data; report at WGISS-35.	Karen Moe	WGISS-35
WGISS-34-6	John Faundeen to send browse statement to Satoko Miura for final distribution/approval.	John Faundeen, Satoko Miura	24-Oct-12
WGISS-34-7	Technology Exploration Interest Group will take responsibility for a survey of existing quality metadata within WGISS members selected data products, and provide a report by WGISS-35.	Technology Exploration IG	WGISS-35
WGISS-34-8	Michael Morahan and John Faundeen to contact WGCV Chair to dialogue over naming issues of DIFs, to allow for uniqueness and clarity.	Michael Morahan	31-Dec-12
WGISS-34-9	Brian Killough and Andy Mitchell to work with Michael Morahan and Lola Olsen to map the MIM keywords into the GCMD.	Brian Killough, Andy Mitchell, Michael Morahan, Lola Olsen	31-Dec-12
WGISS-34-10	IDN to review the GEONETCAP Portal and suggest where it should be linked in time for the CEOS Plenary.	IDN team	24-Oct-12
WGISS-34-11	Richard Moreno to design a session at WGISS-35 to discuss WGISS way forward/ future strategy.	Richard Moreno	WGISS-35
WGISS-34-12	Michelle Piepgrass to consolidate discussion of 5-Year Plan and send to WGISS-All by October 3, 2012.	Michelle Piepgrass	3-Oct-12
WGISS-34-13	IG/P leads to update their page of the WGISS website in time for CEOS Plenary, October 24, 2012.	IG/P Leads	24-Oct-12
WGISS-34-14	Karen Moe to document lessons learned on sensor web activities by WGISS-35.	Karen Moe	WGISS-35

6.4 Adjourn

Dr. D. S. Jain expressed satisfaction to see these very useful deliberations, and good interactions with each other from many countries and with ISRO colleagues. He thanked WGISS for coming to Hyderabad, and encouraged the group to carry forward actions, meeting outcomes and continue to work together. He mentioned the other ISRO complex about 40 Km. from Hyderabad, where all operational systems occur, a brand new facility will all the mission control. Next time WGISS meets in India he hopes WGISS can visit the new facility. He wished WGISS all the best.

Satoko thanked ISRO for their hospitality, and noted how happy WGISS is to meet and work with ISRO participants, stimulating discussions, and amazing presentations. She added that everyone enjoyed the resort presentation of Rajasthan, a typical village. Two turbans were given by hotel, and allotted to Costas and Andy; it is a very big honor to wear the hat.

Satoko adjourned the meeting, once again thanking WGISS for its participation and ISRO for the venue and logistics.

7 Glossary of Acronyms

AC	Atmospheric Composition
API	Application Programming Interface
CCSDS	Consultative Committee on Space Data Systems
CEO	CEOS Executive Officer
CEOP	Co-ordinated Energy and Water Cycle Observation project
CEOS	Committee on Earth Observation Satellites
Charter	International Charter on Space and Major Disaster
CODATA	Committee on Data
CoP	Community of Practice
CSW	Catalogue Service for the Web
CWIC	CEOS WGISS Integrated Catalogue
DEM	Digital Elevation Model
DIF	Directory Interchange Format
EO	Earth Observation
ES	Earth Science
GCI	GEOSS Common Infrastructure
GENESI	Ground European Network for Earth Science Interoperations
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GIS	Geospatial Information System
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
TMSG	Terrain Mapping Subgroup
ToR	Terms of Reference
VC	Virtual Constellation
WADC	WGISS Architecture Data Contributions
WG	Working Group
WGCV	Working Group on Calibration and Validation
WGCapD	Working Group on Capacity Building & Data Democracy