MINUTES

OF THE

48th MEETING

OF THE

CEOS WORKING GROUP ON   
INFORMATION SYSTEMS AND SERVICES

(WGISS)

Hanoi, Vietnam

October 8-11, 2019

Hosted by

Vietnam National Space Center (VNSC)

Table of Contents

[1 WGISS Plenary Session, Part I 6](#_Toc23710873)

[1.1 Introduction 6](#_Toc23710874)

[1.2 Host Welcome 6](#_Toc23710875)

[1.3 Systems Engineering Office (SEO) Report 6](#_Toc23710876)

[1.4 WISP Report 6](#_Toc23710877)

[1.5 WGISS Chair Report 6](#_Toc23710878)

[1.6 CEOS Executive Officer (CEO) Report 10](#_Toc23710879)

[1.7 WGISS Plenary Discussion, Summary of Actions 11](#_Toc23710880)

[2 Data DISCOVERY and ACCESS 12](#_Toc23710881)

[2.1 Connected Data Assets System Level Team 12](#_Toc23710883)

[2.1.1 WGISS Connected Data Assets Status Report 12](#_Toc23710884)

[2.1.2 CWIC Report 12](#_Toc23710885)

[2.1.3 IDN Report 12](#_Toc23710886)

[2.1.4 FedEO Report 13](#_Toc23710887)

[2.2 NASA Services/Tools Metadata Refactoring Efforts 13](#_Toc23710888)

[2.3 NOAA One-Stop and the Cloud 13](#_Toc23710889)

[2.4 OGC Happenings 13](#_Toc23710890)

[2.4.1 OGC 19-020: Testbed-15 Service Discovery 13](#_Toc23710891)

[2.4.2 OGC17-084: EO Collection Metadata 14](#_Toc23710892)

[2.5 GEOSS Platform – New Version “Data and Knowledge” 14](#_Toc23710893)

[2.6 Data Discovery and Access Discussion, Summary of Actions 14](#_Toc23710894)

[3 Data INTEROPERABILITY and USE 15](#_Toc23710895)

[3.1 Introduction 15](#_Toc23710897)

[3.2 ARD/AODS in Apache SDAP 15](#_Toc23710898)

[3.3 OPeNDAP in the Cloud 15](#_Toc23710899)

[3.4 Forest Monitoring Initiative and Vietnam Data Cube 15](#_Toc23710900)

[3.5 Carbon Portal Presentation and Demonstration 15](#_Toc23710901)

[3.6 UK ARD, Downstream and Calibration Data 16](#_Toc23710902)

[3.7 UK Open Data Cube Initiatives 16](#_Toc23710903)

[3.8 FDA and OSS Inventory and Demonstrations 16](#_Toc23710904)

[3.9 Why to Watch WFS 3.0 16](#_Toc23710905)

[3.10 ONDA DIAS 17](#_Toc23710906)

[3.11 CREODIAS 17](#_Toc23710907)

[3.12 Data Cubes Interoperability – Setting the Scene 17](#_Toc23710908)

[3.12.1 Progress on the Euro Data Cube 17](#_Toc23710909)

[3.12.2 Progress on the ESA PDGS Data Cube 17](#_Toc23710910)

[3.12.3 Progress on the Open Data Cube (ODC) 17](#_Toc23710911)

[3.13 Roadmap and Short Term Activities on Interoperability between ODC / HMDC / EuroDC 18](#_Toc23710912)

[3.14 Data Interoperability and Use Discussion, Summary of Actions 18](#_Toc23710913)

[4 Data PRESERVATION and STEWARDSHIP 19](#_Toc23710914)

[4.1 Persistent Identifiers 19](#_Toc23710916)

[4.1.1 Persistent Identifiers for ESA EO Data 19](#_Toc23710917)

[4.1.2 NOAA Persistent Identifiers 19](#_Toc23710918)

[4.1.3 CNES Persistent Identifiers for EO Data 20](#_Toc23710919)

[4.2 Preservation Pilot Project 20](#_Toc23710920)

[4.3 PV2020 Conference 20](#_Toc23710921)

[4.4 ESA EO Thesauri 20](#_Toc23710922)

[4.5 NOAA Maturity Matrix Self-Assessment Tool 21](#_Toc23710923)

[4.6 EDAP: Quality Assessment Matrix 21](#_Toc23710924)

[4.7 RDA FAIR Maturity Model and Way Forward for Finalization of WGISS Maturity Matrix 22](#_Toc23710925)

[4.8 AVHRR European Dataset Preservation and Valorization Project 22](#_Toc23710926)

[4.9 Data Preservation and Stewardship Discussion, Summary of Actions 23](#_Toc23710927)

[5 TECHNOLOGY EXPLORATION 24](#_Toc23710928)

[5.1 Blockchain and Earth Observation 24](#_Toc23710930)

[5.2 NASA Earthdata Knowledge Base 24](#_Toc23710931)

[5.3 Data and Information Provenance in NCA4 24](#_Toc23710932)

[5.4 Second Environmental Linked Features Interoperability Experiment 24](#_Toc23710933)

[5.5 OGC API - Features: A Resource Oriented Alternative to WFS 25](#_Toc23710934)

[5.6 STAC – Spatiotemporal Asset Catalog 25](#_Toc23710935)

[5.7 Technology Exploration Discussion, Summary of Actions 25](#_Toc23710936)

[6 Agency and Liaison Reports 26](#_Toc23710937)

[6.1 ISO 19165-2 26](#_Toc23710939)

[6.2 ISO TC 211 26](#_Toc23710940)

[6.3 UKSA 26](#_Toc23710941)

[6.4 JAXA 26](#_Toc23710942)

[6.5 CNES 27](#_Toc23710943)

[6.6 NASA 27](#_Toc23710944)

[6.7 ESA 27](#_Toc23710945)

[7 WGISS Plenary, Part II 28](#_Toc23710946)

[7.1 Future Meetings 28](#_Toc23710948)

[7.2 CEOS Working Groups Reports and Progress on Cooperation with WGISS 28](#_Toc23710949)

[7.2.1 WGCV 28](#_Toc23710950)

[7.2.2 WGCapD 28](#_Toc23710951)

[7.2.3 WGClimate 28](#_Toc23710952)

[7.2.4 SDG AHT 29](#_Toc23710953)

[7.2.5 CEOS Working Groups Cooperation Discussion, Summary of Actions 29](#_Toc23710954)

[7.3 WGISS Summary 30](#_Toc23710955)

[7.4 Review of WGISS-47 Actions 30](#_Toc23710956)

[7.5 WGISS-48 Actions 30](#_Toc23710957)

[7.6 Concluding Remarks 32](#_Toc23710958)

[8 Glossary of Acronyms 33](#_Toc23710959)

CAS/AOE Xuesong Li\*, Ziyang Li\*

CNES Richard Moreno

CONAE Homero Lozza\*

CSIRO Robert (Rob) Woodcock (WGISS Vice-chair), Cindy Ong\* (WGCV Chair)

ESA Mirko Albani (WGISS Chair), Steven Hosford\* (CEOS Executive Officer)\*, Clement Albinet\*, Paolo Castracane\*, Yves Coene\*, Guido Colangeli\*, Andrea Della Vecchia\*, Philippe Goryl\*, Damiano Guerrucci\*, Iolanda Maggio, Stephan Meissl\*, Grega Milcinski\*, Philippe Mougnaud\*, Marc Paganini\*, Romeo\*, Michelle Piepgrass (WGISS Secretary)

EUMETSAT Joerg Schulz\*

HSO Gábor Remetey-Fülöpp\*

ISRO Nitant Dube, S. P. Aggarwal\*

JAXA Makoto Natsuisaka, Yousuke Ikehata

NASA Andrew (Andy) Mitchell, Andrew Cherry\*, Lauren Childs, Valerie Dixon, Thomas Huang\*, Brian Killough (CEOS-SEO)\*, Dawn Lowe, Andrew Lubawy\*, Michael Morahan, Douglas (Doug) Newman\*, Dan Pilone\*, Hampapuram (Rama) Ramapriyan\*, Nancy Ritchey\*, Archie Warnock\*, Min Wong

NOAA Kenneth (Ken) Casey, Liping Di

OGC George Percivall\*

OPeNDAP James Gallager\*

SANSA Tendani Lavhengwa

UKSA Esther Conway\*, Robert Fletcher

USGS David Blodgett\*

University of Bern Stefan Wunderle\*,

VNSC Vu Anh Tuân, PhamThi Thanh Nga

Commercial participants Reid Sherman\*, Alistair Ritchie\*, Alek Cesarz\*, Franck Ranera\*



# WGISS Plenary Session, Part I

## Introduction

Mirko Albani (ESA), WGISS-Chair, opened the WGISS-48 meeting thanking everyone for their participation. He asked each participant to introduce him/herself. Mirko gave the highlights of the agenda and the agenda was adopted. He noted that this is a working meeting, and invited active participation from in-person and remote attendees. Mirko also thanked the Vietnam National Space Center (VNSC) for hosting the meeting and for the excellent arrangements made on behalf of the meeting.

## [Host Welcome](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T0930_VNSC_Host%20Welcom.pptx)

Dr. Vu Anh Tuân, VNSC Vice-director General, welcomed WGISS to the WGISS-48 meeting, wishing success for the outcomes of the meeting. He began with an overview of VNSC, established under Vietnam Academy of Science and Technology in 2011; VNSC and now has 120 employees and growth is expected to continue. Dr. Tuân displayed the organisation chart and the growth of the organisation. Dr. Tuân mentioned that VNSC aims to develop a national product for small satellites and described the roadmap for planned EO missions.

Dr. Tuân described several space technology applications in Vietnam: rice crop monitoring, forest mapping and monitoring, coastal zone erosion management, flood monitoring, and hazards applications.

Dr. Tuân also addressed the Vietnam Data Cube, a CEOS activity with the technical support of CSIRO and IMSG, having applications in forest monitoring, rice crop monitoring and water quality, and plans to expand to Laos, Cambodia, and Thailand. Dr. Tuân also described the Department of Astrophysics and VNSC’s international cooperation and education efforts.

Dr. Tuân discussed the Vietnam Space Center Project with outcomes to assist social – economic development via the building and integration of the facilities and equipment of the National Space Center and developing EO satellite technology. The project’s missions are focusing on R&D on space science and technology to product realisation by development of the Vietnam National Space Center.

Dr. Tuân showed a video describing VNSC.

## [Systems Engineering Office (SEO) Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1010_SEO_Report.pptx)

Brian Killough\* presented a report from the Systems Engineering Office (SEO). He discussed status of the COVE Tool and the CEOS Open Data Cube (ODC). He described the data flow for Global Landsat, Sentinel-1, Sentinel-2, and ALOS level-2 analysis-ready data (ARD) in cloud-optimised COG (Cloud GeoTIFF) format on the cloud to support a number of global data cube projects and provide an efficient cloud-based solution. Brian also discussed the SEO involvement with the WGISS OSS inventory project.

## [WISP Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1500_WISP_Report.pptx)

Michelle Piepgrass gave the status of the WGISS Infrastructure Support Project (WISP). She announced that the CEOS email lists have been moved to a new platform (LISTSERV), and have been simplified. The WGISS website has been maintained and is up-to-date, though the file repository needs to be reviewed to remove unnecessary files. The concern was raised that the wgiss.ceos.org URL, now being used by LISTSERV, is also referenced as a link to the WGISS web page on the WGISS brochure.

WGISS has agreed to close the project; the activities will be absorbed by the WGISS Secretariat and the SEO.

Action WGISS-48-04: Michelle Piepgrass to discuss with Brian Killough the possibility of restoring the URL wgiss.ceos.org since it is referenced in several brochures. Due by November 2019.

## [WGISS Chair Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1540_Chair%20Report.pptx)

Mirko Albani presented a report to WGISS about CEOS and GEO matters.

Mirko reported the following:

* WGISS interagency coordination is working well, very good cooperation spirit and healthy participation to meetings (average 20 people). Some members are attending all meetings (e.g. NASA, NOAA, USGS, CNES, ESA, CSIRO, JAXA, CAS/RADI, CAS/AOE, HSO), and others attending some meetings depending on location/topics (e.g. CSA, EUMETSAT, ROSCOSMOS, INPE, CONAE, DLR, UKSA, ISRO). Additional agencies expressed interest in WGISS activities with potential future (stable) participation (e.g. GISTDA, VNSC/VAST, ASI).
* The WGISS chairmanship after 2019 CEOS Plenary is to be:
  + WGISS Chair: Robert Woodcock (CSIRO)
  + WGISS Vice-chair: Makoto Natsuisaka (JAXA)
* The WGISS Infrastructure Services Project (WISP) core services/support (e.g. web conferencing, website, mailing list, meetings archive) will be shared between WGISS Secretariat and SEO team.

The following CEOS Work Plan actions affect WGISS:

* CARB-15: Carbon Data Portal - *Action Closed*
* DATA-2: CEOS Agency datasets through WGISS CDA - *Q2 Every Year*
* DATA-9: ECVs/CDRs - *Q4 2019*
* DATA-11: Technology webinars - *Q4 2019*
* DATA-13: Single Sign-On Paper - *Q2 2019*
* DATA-15: AI White Paper - *Q4 2020*
* DATA-16: CEOS data in GEO - *Q4 2019*
* FDA-5: Awareness of FDAs - *Action Closed*
* FDA-8: FDA Block Paper - *Q3 2019*
* FDA-9: FDA Inventory - *Action Closed*
* FDA-10: Software/Tools Inventory & Access - *Q3 2019*
* FDA-14: SW tools access through WGISS CDA - *Q4 2020*

The SIT Technical Workshop in September included a WG and VC working day, having the following topics and outcomes:

1. WG Study Team: address additional user community needs (e.g. from GEO) through the set-up of as new working group:
   * + Recommendation to use existing CEOS organisation without a new WG;
     + WG study team to prepare a final proposal for CEOS plenary endorsement.
2. Ocean Virtual Constellations Merger Study Team: merge four Ocean VCs to increase engagement and improve delivery of cross-domain, integrated products:
   * + Recommendation not to merge the four OVCs (3 pros, 8 cons);
     + Need to implement a more rigorous tasking and feedback process between CEOS agency principals and individual VCs, and to identify a CEOS mechanism to develop requirements for integrated/cross-domain products to be delivered in a coordinated way by individual VCs.
3. Minor Language update in the VC Process Paper for VC Leadership Succession.
4. Data Exploitation/Use session (chaired by WGISS/WGCV) and actions:
   * Interplay between WGCV and WGISS on calibration may be a fruitful work area for future;
   * Outreach to Agencies for compliance with guidelines is slow, suggest we work through VCs in addition;
   * If end-user motivated data formats or approaches are developed within VCs, they should coordinate with WGISS.
   * AI.WGDAY.01A WGISS SLT to review VC data collection inventories (EXCEL) and confirm if/what information is missing to generate DIF-10 metadata for the datasets therein included;
   * AI.WGDAY.01B WGISS SLT to prepare a template for VC Leads to gather information for IDN registration. Ask for specific needs (e.g. One-stop-shop data discovery and access for relevant data sets and tools? Community portals?);
   * AI.WGDAY.02 WGISS SLT to continue work with SDG AHT Lead for discovery/access to SDG indicators relevant datasets.
5. The CEOS ARD Strategy (August 🡪 October 2019) reports good initial progress for the land imaging elements of ARD (CARD4L) but more general ARD applicability for CEOS needs to be demonstrated with non-land imaging examples. The strategy is built around four pillars with actions:
   * CEOS ARD User needs/specs 🡪 1.4 CEOS Interoperability Terminology Report (Q2 2020, WGISS/Others);
   * Assured Production & Access 🡪 2.2 Facilitate Discovery of and Access to CEOS agencies ARD (Q1 2020 onwards, WGISS); 2.4 CEOS paper on interplay of industry and CEOS ARD (Q2 2020, Others/WGISS)
   * Pilots and Feedback 🡪 3.1 Production of ARD and supply of data aggregators and platforms (Q3 2019 onwards, Others/WGISS)
   * Communication/Promotion 🡪 4.3 CEOS ARD stock-take and outlook (Q3 2019 onwards, others/WGISS).
   * Action: WGISS Contribution to ARD Strategy to be addressed in more detail and possibly translated in relevant actions for the CEOS Work Plan 2020-22 (process to be clarified with CEO)
   * Action: ARD products tools. Explore possibility to organise a dedicated session at WGISS-49.
6. GHG and Carbon
   * No current need for update to the Carbon Strategy;
   * GHG Roadmap: CEOS group roles identified, need to work more with CGMS.
   * Action: Update WGISS Glossary of Terms to add ECV definitions and other interoperability related terms to help in communicating with external entities: cooperation with WGClimate/LSI-VC/WGCV.
7. Coastal Observations: Suggestion to form a Study Team to initiate the discussion on Coastal observations; include multi-sensor observations through value chain to extract information for users.
   * SST-VC preliminarily expressed the need of a Data Cube for coastal activities: could be a potential WGISS project (Pilot contribution to ARD strategy). To be further investigated.
8. GFOI
   * AHT will contact WGISS to share what works and what does not work with CEOS agencies in terms of data access and see if/how we can help.
   * GFOI registered 34 tools and services which could be potentially added to the WGISS SW/Tools inventory. To be further investigated.
9. Others
   * Knowledge Hub implementation at CEOS level?
     + WGISS should continue our work with DOIs to ensure that Metadata at collection level in the IDN contain a DOI pointing to relevant information in landing pages.
   * Should WGISS address AI on-board satellites (e.g. on-board processing)?
   * AI could help in the CAL/VAL domain; Training systems datasets; Support traceability issues in the public policy context.
     + How can WGISS use Artificial Intelligence to support WGCV activities? Any improvement/evolution of ongoing activities with Data Cubes?

The CEO position after CEOS 2019 Plenary currently vacant 🡪 impact on CEO activities like CEOS Work Plan 2020-22 preparation.

WGISS report on status/progress of activities/deliverables to the SIT included:

* Several white papers produced on Data Stewardship Best Practices.
* WGISS Connected Data Assets (includes IDN/CWIC/FedEO) are now classified as a CEOS Service, with GEO one of the main users.
* FDA activities in WGISS are addressing: services/tools/elements discoverability; interoperability; showcasing support to CEOS/GEO Initiatives; and, outreach.
* Cooperation with WGCV: ESA PDGS Data Cube (<https://preops.eodatacube.eu/>) provides services to RadCalNet, and ACIX (In-situ and S-2/L-8) data, including Jupyter notebooks to reproduce ACIX use cases: <http://calvalportal.ceos.org/results>.
* Exploring topics related to Artificial Intelligence and Machine Learning.
* A number of activities with other CEOS Teams (e.g., Carbon/WGClimate, WGDisasters, WGCV, VCs, WGCapD, SEO, and SDG AHT), as well as a number of contributions to GEO.
* Robert Woodcock (CSIRO) will take over as WGISS Chair from Plenary, with Makoto Natsuisaka (JAXA) as Vice Chair.

Mirko discussed the following synergies among CEOS teams:

* CEOS Carbon Team/WGClimate - Carbon Portal development and possible use for next phase of carbon strategy, *ECV/CDRs* registration in IDN, ECV inventory update automation.
* WGDisasters - possible cooperation on generic recovery observatory.
* WGCV - Data cube prototypes (ESA and GA/CSIRO) supporting CAL/VAL activities through providing access to ACIX (16 sites), RadCalNet (4 sites) and LPV (3 sites) cal/val data; CEOS Data Maturity matrix.
* Virtual Constellations - inventory of VC data to be updated to review discoverability/accessibility through WGISS CDA infrastructure.
* WGCapD - joint organisation of technology webinars and FDA events.
* SEO - COVE tool harvesting WGISS metadata, data cubes coordination, implementation of web pages for tools/SW discovery.
* SDG AHT - discovery of SDG indicators relevant data via WGISS CDA.

WGISS contribution to GEO:

Past/Current

* GEOSS Platform accessing CEOS data via WGISS CDA
* WGISS contribution to GEOSS-EVOLVE initiative, GEO Expert Advisory Group (EAG) and GEO Technology Workshops
* WGISS represented in NextGEOSS Advisory Board and working on federated authentication technology
* GEO Sec reporting during WGISS meetings; Joint Workshops on GEOSS-WGISS interoperability and FDA at WGISIS-43/46, GEO Knowledge Hub side event at SIT-34

Future

* Contribution to GEOSS Data, Information and Knowledge Resources and GEOSS Infrastructure Development Tasks
* Advance Data Management Principles through Data Sharing and Mgmt. Working Group 🡪 M. Albani (ESA), R. Moreno (CNES)
* Facilitate CEOS agencies data access via WGISS CDA, contribute technologies and solutions for GEOSS Infrastructure Evolution
  + GEOSS Infrastructure Development Task Team 🡪 R. Woodcock (CSIRO)
  + GEOSS Infrastructure Evolution Working Group 🡪 M. Albani (ESA), A. Mitchell (NASA, TBC)
* Coordinate with GEO Sec for joint workshops
* Input provided to GEO Secretariat

Additional WGISS achievements:

* Web-page initiated and maintained on the CEOS website under "Our Work” to facilitate discovery and access to Best Practices and Guidelines developed by CEOS WGs; WGISS coordinating population in cooperation with SEO team.
* New Data Set Availability Alert Procedure defined and implemented with SEO team to publicise new available data.
* Google Data Search Tool report compiled with inputs from NASA, DLR, NOAA, and ESA. It describes how the tool allows discovery of CEOS agencies data. This is under review by WGISS, will be circulated by end September.

## [CEOS Executive Officer (CEO) Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/201910T1610_CEO-CEOS_Context_WP.pptx)

Steven Hosford\* gave the CEO report. He discussed the following topics:

* 2019 Chair priorities:

Priority #1: Carbon Observations (forested regions)

Priority #2: Observations for Agriculture (rice)

* Chair priorities 2020:

Priority #1: Build “Real Constellations”

Priority #2: GEO-processing for disasters

Priority #3: Data Cube for BIMSTEC

Priority #4: Renewable energy assessment

* CEOS Leadership

CEOS Chair - VNSC, Vietnam in 2019; ISRO subsequently

CEOS SIT Chair – NOAA until October 2019; CSIRO/GA subsequently

Candidate for CEOS Executive Officer urgently required

* Two Study Teams formed on creation of new WG and merging of Ocean VCs recommend no immediate changes
* CEOS Work Plan:

CEOS 2019-2021 Work Plan available [online](http://ceos.org/document_management/Publications/CEOS_Work-Plans/CEOS_2019-2021-Work-Plan_April2019.pdf)

Slight structural changes

CEOS “Services” concept created (7 “deliverables” in 2019-2021 WP)

Some “best practice” proposed in this presentation

CEOS 2019-2021 Work Plan Progress Report out soon

Mirko noted that WGISS would like to be in position in the value chain.

## [WGISS Plenary Discussion, Summary of Actions](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1630_WGISSPlenarySummary_Actions.pptx)

Mirko Albani presented open actions from WGISS-47, and status was updated. It was agreed that these remain open:

WGISS-47-12 Michael Morahan to register services/tools from inventory tables (FDA elements and SW/tools) into IDN starting from the ones presented at WGISS-47

WGISS-47-16 Robert Woodcock to liaise with AquaWatch representatives to gather their requirements/needs and further define how WGISS could support

WGISS-47-17b WGISS CDA System Level Team (SLT) to Start Actions as agreed (e.g. implement CEOS branding on IDN portal and underlying FedEO and CWIC when appearing for second step searches, etc.) Due by December 31, 2019.

WGISS-47-17c WGISS CDA System Level Team (SLT) to Assess advantages and feasibility to implement (part of) CEOS Data Usage Metrics in the IDN portal / WGISS Connected Data Assets. Due by December 31, 2019.

WGISS-47-19 Iolanda Maggio and Andrew Cherry finalise SW Inventory database tool, present to WGISS-Exec and publish on CEOS website

WGISS-47-26a Iolanda Maggio to liaise with Ge Peng to find out when the WMO documents on stewardship are approved by October 31, 2019

WGISS-47-26b Iolanda Maggio to liaise with WGCV to collect comments on WGISS and WMO maturity matrices (once the WMO documents are approved) by December 31, 2019

WGISS-47-29 CDA SLT to analyse what kind of effort and solution can be accomplished by WGISS to automate future ECV Inventory updates [last slide of presentation]

WGISS-47-30 CDA SLT to send to WGClimate the list of elements in the inventory that should be made mandatory so they can be registered automatically

WGISS-47-31 Mirko Albani and Yonsook Enloe to contact the KMA and JMA to get their assets connected

WGISS-47-36 Technology Exploration IG to define a template suitable for gathering inputs from agencies (domain, use case, datasets, labels, dataset accessible accessibility) in the areas of Machine Learning and Artificial Intelligence

Richard Moreno suggested aligning all the data access initiatives to reach one standard, so it was agreed to organise a session at WGISS-49.

Action WGISS-48-05: WGISS CDA-SLT to organise a session at WGISS-49 on services discovery and access with the goal to align the approaches of OGC, CDA, and GEO. Due by WGISS-49.

# Data DISCOVERY and ACCESS



## Connected Data Assets System Level Team

### [WGISS Connected Data Assets Status Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1030_CDA.pptx)

Andrew (Andy) Mitchell presented the WGISS Connected Data Assets (WCDA) status report. He introduced the purpose of the team, the architecture, and the current activities.

The CDA-SLT was tasked at WGISS-47 to identify the best approach to implement a single map-based front-end/portal to discover and access CEOS agencies data through WCDA back-end and implement CEOS branding for portal. NASA’s Earth Data Search Client (EDSC) is offered for this. EDSC can search collections registered in IDN and activate the granule search for CWIC and FedEO collections at the data partner sites. Michael Morahan will demonstrate this during the IDN report.

The CDA-SLT was tasked at WGISS-47 to assess advantages and feasibility to implement (part of) CEOS Data Usage Metrics. The CDA-SLT analysed the current metrics being reported or planned to be reported by IDN, CWIC and FedEO to identify what metrics can be collected by the WCDA and found they can collect metrics associated with metadata search and not the data access. Of primary importance are the metrics associated with usage of the system (metadata search) and failures (number of searches that failed; average time of search completion). Failure metrics will be used to identify system failure at data partner sites.

The CDA-SLT was tasked at WGISS-47 to analyse what kind of effort and solution can be accomplished by WGISS to automate future ECV inventory updates and to send WGClimate the list of elements in the inventory that should be made mandatory so they can be registered automatically. It takes sustained effort to analyse the spreadsheets for ECV dataset information and align that with the IDN fields needed for dataset registration and to communicate that information back to the WGClimate. Registration of ECV datasets is much improved.

Mirko noted that Andrea is also working with EUMETSAT to analyse the contents of their metadata. Most information for DIF-10 is available, and Andrea is working on fixing the discrepancies and is awaiting feedback from WGClimate. After EUMETSAT makes the corrections, they should be able to extract from the spreadsheet the contents of the ECV inventory. Mirko also wondered how they can automate the implementation of the report; there are about 50 fields and Andy wondered if the IDN could be used; Michael confirmed there is a way forward for this.

Andy discussed the steps for a WGISS federation and the current metrics available. Current challenges are adding services and tools, and developing FDA capabilities. He also noted efforts in working with GEOSS and listed outreach tools for developers.

It was recommended that WGISS only support CEOS OpenSearch going forward and not OGC CSW 2.0.2.

### [CWIC Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1050_CWIC-Report.pptx)

Archie Warnock\* gave the CWIC report. He described the methodology for collecting CWIC metrics. He noted that the CWIC synchronisation document has been completed and that it includes description and details (test scripts) of the daily dataset accessibility testing that is performed automatically. The FedEO team has implemented the test scripts also. The CWIC Data Partner Guide updates have been completed; testing with NOAA One-Stop continues.

### [IDN Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1130_IDN_Update.pptx)

Michael Morahan gave the IDN report. He discussed and demonstrated the new IDN client, which is capable of collection searches, map/spatial tools, collection information displays and granule results.

Michael also discussed and demonstrated the status of the draft Metadata Management Tool (dMMT). It includes a dashboard for managing collections.

Michael concluded with IDN metrics.

There followed a discussion of the branding of the new IDN search portal. Michael reported that the test version has labels for CWIC, FedEO, and CEOS. Andy questioned the value of displaying the CWIC tag, and suggested hover text instead.

Michael commented that it is essential that all data list an owner or else it becomes stale.

### [FedEO Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1150_FedEO_Report.pptx)

Mirko Albani gave the FedEO report. He discussed the FedEO Metadata Mediator and the DIF-10 metadata export. He reported that most harvested collections are ready for being ingested in the IDN, though some effort is still required on ECV, CCI and CMEMS.

Mirko also discussed the ESA PDGS Collaborative Environment, the ESA Catalogue, and the web interface FedEO metrics. He concluded with a description of the FedEO evolution.

## [NASA Services/Tools Metadata Refactoring Efforts](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1210_ServiceMetadataRefactoring.pptx)

Valerie Dixon presented two solution models for the problems of the Single Unified Metadata Model-Services (UMM-S) as it was becoming too complex to manage well. This activity is in response to Action WGISS-47-11.

* New UMM-Tools for “Front-End” (Web User Interface) tool access with downloadable tools (basic) and smart handoffs (advanced)
* UMM Services for the “Back-End”

## [NOAA One-Stop and the Cloud](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1330_NOAA-OneStop-and-the-Cloud.pptx)

Kenneth (Ken) Casey presented NOAA One-Stop and the Cloud. He noted that a key strategic objective of NESDIS is to implement an enterprise ground system in the Cloud. A business readiness plan has a focus on people, process and technology, and NESDIS is currently in the proof-of-concept phase toward the goal of an integrated enterprise vision which is revolutionary for NESDIS. Progress to date includes bringing in a dozen data streams, multiple products generated, all on AWS. The goal of OneStop is to improve the discovery of, access to, and usability of NOAA’s vast and diverse collection of data.

Ken reported that the Data Stewardship Maturity Model assessments were conducted at scale, incorporated into ISO metadata, and used as basis for streamlined Data Stewardship Maturity Questionnaire (DSMQ).

NESDIS has achieved a number of tasks: the Initial Common Metadata Editor Tool (CoMET) has been deployed and is available for stakeholder testing. The Collection Manager supporting tools have been operationalised, and training and user feedback was collected at the September 2019 Workshop. The User’s Guide and DSMQ glossary were published to NOAA EDM Wiki. MediaCurrent third-party usability testing is completed.

Ken reported that the initial framework for the Open Data Framework has been established. He described in detail the Open Data Framework, whose ultimate goal is to drive all access off the OneStop API. He noted that OneStop’s Open Data Framework components are at different stages of maturity; some are fully operational while others are just getting started.

## OGC Happenings

### OGC 19-020: Testbed-15 Service Discovery

Yves Coene\* presented the OGC19-020: Testbed-15 Service Discovery. By way of introduction he listed the various relevant OGC activities. The service discovery model objectives are a developer-friendly solution consistent across environments to discover, deploy, invoke “building blocks”, and the deliverables include Engineering Report OGC 19-020.

Yves discussed the Service Discovery Model and the Service Management Interface. He described the collections and services (using GeoJSON). The services include FeatureCollection, Faceted Results, and Feature, supporting multiple implementations.

Yves concluded that the modular discovery interface contains simple (OpenSearch) and advanced clients (OGC API Common and OpenAPI). The service-binding agnostic data model is also applicable in JSON-LD, RDF (SPARQL), Linked Data, and OGC API Features. Maximum reuse of existing specifications include:

* OGC 14-055r2 (OWS Context)
* DCAT (V2), DCAT-AP, GeoDCAT-AP metadata specifications
* OGC 13-026r8, OGC 10-032r8 OpenSearch
* OGC 17-047 OpenSearch GeoJSON(-LD) Response
* OGC API Common, OASIS searchRetrieve Explain

### [OGC17-084: EO Collection Metadata](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1350_OGC17-084-EO-Collection-Metadata.pptx)

Yves Coene\* presented the OGC17-084: EO Collection Metadata. He noted that the WCDA-SLT review process of OGC 17-003 raised comments related to collection metadata. EOPMOS SWG at OGC TC Portsmouth 09/2017 agreed to prepare a dedicated document for EO collection metadata since then identified as OGC 17-084. All intermediate versions are available on OGC SWG Portal pages. Mature draft provided to WCDA-SLT for comments.

Yves gave an overview of OGC 17-084, which has a similar approach and presentation as OGC 17-003 (Granule Metadata). He made the following conclusions:

* The data model defined as GeoJSON, and JSON (-LD), thus applicable for linked data (RDF).
* Formal definition using JSON schema is OpenAPI compatible.
* Maximum reuse of existing specifications and vocabularies: OGC 14-055r2 (OWS Context), DCAT (V2), DCAT-AP, GeoDCAT-AP, and OGC 17-003 (EO Vocabulary).
* Consistent with similar specifications for: OpenSearch GeoJSON (-LD) Responses (OGC 17-047), EO Granule Metadata (OGC 17-003), and Application and Service Metadata (OGC 19-020).
* Traceability covers main elements from UMM-C and ISO19139 (-2).
* Implementations: <http://geo.spacebel.be/opensearch/readme.html> and <http://databio.spacebel.be/eo-catalog/readme.html>
* Next steps are to address WCDA-SLT review comments and to move specification forward in EOPMOS SWG.

Discussion affirmed that WGISS has a relationship with OGC, and needs an agreement with OGC to share the document. Chris Lynnes (NASA principal at OGC) is able to obtain it.

## [GEOSS Platform – New Version “Data and Knowledge”](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1410_GEOSSPlatform.mp4)

Guido Colangeli\* discussed the GEOSS Platform. He described the GEOSS concept architecture, detailing the presentation layer and the concept architecture. He stated that the GEOSS Platform is evolving in the context of EuroGEOSS, GEOEssential and the SDGs.

Guido made a demonstration of the GEOSS Portal.

Andy commented that WGISS has a lot of synergies with GEOSS, and suggested that WGISS consider a workshop in near future. Guido said he would be very happy to join forces.

## [Data Discovery and Access Discussion, Summary of Actions](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/1.%20Tuesday%20October%208/20191008T1430_Data-Discovery-and-Access-Summary-of-Actions.pptx)

Mirko Albani led a discussion on status of WGISS-47 actions, and of DATA-16 and DATA-02. The following new actions were developed:

Action WGISS-48-04: Michelle Piepgrass to discuss with Brian Killough the possibility of restoring the URL wgiss.ceos.org since it is referenced in several brochures. Due by November 2019.

Action WGISS-48-05: WGISS CDA-SLT to organise a session at WGISS-49 on services discovery and access with the goal to align the approaches of OGC, CDA, and GEO. Due by WGISS-49.

Action WGISS-48-06: WGISS CDA-SLT to review VC data collection inventories spreadsheet and confirm if/what information is missing to generate DIF-10 metadata for the datasets therein included. Due by December 2019.

Action WGISS-48-07: WGISS CDA-SLT to prepare a template for VC Leads to gather information for IDN registration. Ask for specific needs (e.g. One-stop-shop data discovery and access for relevant data sets and tools? Community portals?). Due by December 2019.

# Data INTEROPERABILITY and USE



## Introduction

Robert Woodcock introduced the Data Interoperability and Use session, which is focused on Future Data Architectures.

## [ARD/AODS in Apache SDAP](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T0940_AODS-in-Apache-SDAP.pdf)

Thomas Huang\* gave a presentation on the Analysis Optimised Data Storage in Apache Science Data Analytics Platform. He began with a description of the traditional method of analysing satellite measurements, and described the enabling of Next Generation of Earth Science Tools and Services. He discussed a scalable data analytic solution and summarised that:

* Climate research requires Autonomously Sustainable Solutions
* Open source and a web of analytics centres should be the architecture for climate science
* Focus on delivering professional quality open source solutions that enables end-to-end data and computation
* Architecture, and the total cost of ownership
* Open source should not be a destination, it should be in place from the beginning
* How a technology is being managed will determine how far it can go

Richard asked if their work is comparable with the Pangeo system. Thomas replied that it is quite different.

Ken Casey inquired as to his thoughts on ARD storage in the CEOS context. Thomas replied that it provides a good start, but does not go as far.

## [OPeNDAP in the Cloud](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1000_OPeNDAP_in_the_Cloud_CEOS.pptx)

James Gallagher\* gave a presentation on OPeNDAP in the Cloud. He began with a discussion of adapting an existing web server to S3, a web object store. Several approaches were evaluated for serving data stored in S3: caching, subsetting, and baselining. Five client applications were tested with Hyrax serving data stored on Amazon's S3 Web Object Store. James concluded that:

* Existing files can be moved to S3 and accessed using existing web APIs
* The web API implementation will have to modified to achieve performance on a par with data stored on a spinning disk
* Existing client applications work as before
* The new implementation provides additional benefits such as enhanced data aggregation capabilities

## [Forest Monitoring Initiative and Vietnam Data Cube](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1020_Forest%20monitoring%20and%20Vietnam%20DataCube.pptx)

Dr. Vu Anh Tuân gave a presentation on the forest monitoring initiative and Vietnam Data Cube CEOS initiatives. The CEOS initiative is a regional application of CEOS data. Dr. Tuân described the forest monitoring project and updated on the progress; the result shows monthly changes between October 2017 and August 2018. He also described future plans to extend to four countries using ALOS-2, and further verification of the algorithm. The results will be transferred to users, including the Ministry of Agriculture and Rural Development (Forest Protection Department), and the Mekong River Commission.

Dr. Tuân also described the Vietnam Data Cube. He stated that VNSC commits to invest for the long term operation cost of the system, and to continue user interface development and maintenance. The applications of the Regional Observatory can be expanded for other issues in the region such as disaster and water management.

Liping suggested that the Vietnam DC be added to CWIC to make it very visible and Dr. Tuân agreed. Mirko mentioned the opportunity for discussion to add this work to the carbon portal.

## [Carbon Portal Presentation and Demonstration](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1110_Carbon-Portal.pptx)

Liping Di gave a progress report and demonstration of the CEOS WGISS Carbon Portal. The portal’s goal is to support the CEOS Carbon Science Mission by providing easy discovery of and access to carbon-related data resources in CEOS member agencies, brokered by FedEO and CWIC. The portal has been released, and completes the deliverable for CARB-15. The team is working with communities on testing and evaluation, has developed new capabilities and improvements, and has migrated the portal to the Cloud. Future plans include:

* Incorporating revision comments and new requirements from CEOS Climate WG and Global Carbon Project into the new version of the portal
* Expanding the targeted user communities (e.g., GEO??)
* Supporting CEOS Chair carbon initiative, collaborating with VNSC.

Liping concluded with a demonstration.

## [UK ARD, Downstream and Calibration Data](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1130_UKARD_Downstrean_CAL_data.pptx)

Esther Conway\* gave a presentation on UK ARD, downstream and calibration data. She discussed UK activities for data access, formats, and interoperability and listed examples of UK ARD activity. She also discussed ASSIMILA: a UK ARD test in support of CEOS standards, and several other initiatives. She concluded with a description of their efforts to enable collaboration federations and portals, analysis platforms and transfer, and Jupyter Notebooks.

## [UK Open Data Cube Initiatives](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1150-UK-Open-Data-Cube-InitiativesII.pptx)

Robert Fletcher gave a presentation on UK Open Data Cube initiatives. The goal is developing a Cloud-agnostic platform for EO analysts to work with ARD) based on the Open Data Cube initiative, utilising the DCAL (Data Cube Application Library) set of applications as a starting point for further development of added-value products that are of interest for the purpose of addressing SDGs. In May they conducted a hackathon to develop core functionality of the Open Data Cube, and to also generate EO products. Robert discussed several applications for coastal and inland water detection, and concluded with a discussion of the Mongolian Data Cube project.

## [FDA and OSS Inventory and Demonstrations](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1330_OSS-FDA-Inventory.pptx)

Iolanda Maggio discussed FDA and OSS inventory efforts. She gave the background of the task to inventory and characterise existing software and tools, which traditionally has been done using spreadsheets. She described the project to fulfil FDA-09 and FDA-10.

Andrew Lubawy\* and Andrew Cherry\* demonstrated the new FDA inventory, showing the list filtering capability and associated metrics. They continued with a display of the OSS inventory, with similar list filtering and associated metrics, and details and statistics pages. He demonstrated how to make or change an entry.

The deployment solution proposal is to have the site managed under the WGISS sub-domain <http://wgiss.ceos.org/>. Ken recommended the data and tools menu option on the CEOS main site. For governance and maintenance, a decision should come from the provenance of the action.

Ken wondered if the UMM could be enabled to take information already collected and export it. Valerie commented that there are a lot of tools inventories, and suggested a prominent last-updated date.

Iolanda noted that the idea is to do the task in two steps, where the next step is to integrate with the services.

## [Why to Watch WFS 3.0](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1410_WhyWatchWFS3.0.pptx)

Valerie Dixon addressed Action WGISS-47-35: CDA SLT and Ad-hoc team led by Valerie Dixon (Michael Morahan, Andrea Della Vecchia, Chris Lynnes, Cristiano Lopes, and Richard Moreno) to look into OGC Testbed 14 results and assess possible use and application within WGISS FDA interoperability activities. She provided a link with the results, noting that there are many candidates. WFS Web Feature Service 3.0 is an ideal choice; it is moving away from XML toward a simple RESTful interface, using JSON and HTML and with OpenAPI support.

Valerie stated that additional benefits of WFS 3.0 are that there is community ownership and feedback, with increased interoperability between applications and platforms and increased interest and usage. WFS makes good use of the move from a distribution of data to a distribution of services.

Richard commented that OGC intends to generalise this, and is analysing how to distribute processing on different exploitation platforms.

## [ONDA DIAS](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1430_ONDA-DIAS.pdf)

Franck Ranera\* presented a new paradigm for accessing and exploiting data to facilitate access to Copernicus data and information and to support the development of Copernicus-based user applications, research and business enablement.

ONDA (People On Data) is a unified place to access geospatial data, providing a cloud-based platform to build applications. He described the data portfolio (full Copernicus Sentinel archives) and the benefits of using cloud resources. He also listed the user services, and described several use cases.

## [CREODIAS](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1450_CREODIAS.pdf)

Alek Cesarz\* presented CREODIAS, the Cloud for Earth Observation Data Processing, offering cloud services and tools for EO data storage, processing and dissemination, and designed for the development and hosting of third party EO applications and data processing chains. He described the services and data offer, search and access capabilities, and user tools. He concluded with examples of live projects on CREODIAS.

Alek clarified that data access outside the six month window (where data is held locally) for some of the less popular data collections (for example Sentinel-1 Level 0 RAW) is through an ordering API. Majority of the data (including Sentinel-1,2,3,5P) is stored locally with full temporal and spatial coverage of the missions.

## Data Cubes Interoperability: Setting the Scene

Robert Woodcock highlighted that learning about interoperability between data cubes is toward the goal of finding where CEOS/WGISS should be seeking to pitch an interoperability level.

### Progress on the Open Data Cube

Robert Woodcock discussed progress on the (CEOS) Open Data Cube (ODC). He listed several uses, and described the base technology, architectural layers, and deployment options. He concluded with options to access the ODC.

### [Progress on the Euro Data Cube](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1540_Euro-Data-Cube.pptx)

Grega Milcinski\* and Philippe Mougnaud\* gave a presentation on the Euro Data Cube, which contributes to the ESA’s “EO Exploitation Platforms” initiative, and is part of the “EO Science for Society” programmatic line that implements a platform service for higher-level data analytics and utilises tiers in EO Networks of Resources for storage and processing.

Grega described the data access and processing services. He also gave information on XCube and its applicability. He concluded that there is a plethora of operational services so the user should combine and exploit what is needed. He added that integration with ODC and Pangeo is on the horizon, and it is OGC-compliant. Grega also elaborated on the interoperability between the ODC and the EuroDC.

### [Progress on the ESA PDGS Data Cube](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1600_ProgressOnTheHMDC.pptx)

Damiano Guerrucci\* and Andrea Della Vecchia\* discussed progress on the ESA PDGS (Payload Data Ground Segment) Data Cube. They listed the DC objectives and presented the conceptual model, and elaborated on three use cases, including one for WGCV. They demonstrated the DC, and concluded with 2019 next steps:

* Finalisation of transfer into operation, supporting new ESA missions and SSO accounting/authorisation
* Synergies with European Data Cube initiative (<https://eo4society.esa.int/2019/05/21/european-data-cube-facility-service-an-eo-resource-factory/>)
* Cooperation with CEOS WGISS / FDA teams:
  + Action WGISS-47-13: Andrea/Rob to define with SEO a roadmap and short term activities on interoperability between ODC / HMDC / DCFS Data Cubes (e.g. Jupyter notebooks with xarray API and WCS / WPS).
  + Action WGISS-47-15: Andrea/Rob to define coordinated roadmap and short term activities on WGISS-WGCV Data Cubes (ESA and ODC DEA) and possibly demo to be shown at SIT TW in September 2019.
* Cooperation with WGCV team (TBD)

## [Roadmap and Short Term Activities on Interoperability between ODC/HMDC/EuroDC](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1640_Roadmap-Short-Term-Activities-on-Interoperability-of-Data-Cubes.pptx)

Robert Woodcock opened a discussion on the roadmap and short-term activities on interoperability between ODC, HDMC, and EuroDC. He presented a simplified layer viewpoint: the access viewpoint, the access viewpoint in the cloud, and the analytics viewpoint.

Rob suggested three types of interoperability:

* CEOS data source to Data Cube: How all DCs interact with source CEOS data and discovery services. DC data preparation services? Algo to Data?
* Data Cube APIs: Do we want interoperability at this level? What does it mean to have a standard EO API? Pangeo, openeo? R/Python?
* Data Cubes exposed via OGC Standards: Analytics as WPS – similar issue to EO algorithm API.

Rob suggested the following roadmap:

* For each, explore what is common (e.g. xarray, Cloud optimised formats)
* Define interoperability for each type (e.g. expose common algorithms as end points, or expose a detailed API, or just common cloud-based data and ARD spec).
* Consider OGC Testbed input.

Richard noted that the exploitation platform needs to be addressed.

## [Data Interoperability and Use Discussion, Summary of Actions](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/2.%20Wednesday%20October%209/20191009T1710_WGISS-Interoperability-Summary-Actions.pptx)

Robert led a discussion on status of WGISS-47 actions. The following new actions were developed:

Action WGISS-48-08: WGISS Interoperability Tiger Team to follow-up interoperability activities between data cubes as defined in the roadmap outlined in the WGISS#48 session (including definition of relevant milestones). The team will include Rob Woodcock (Lead), Andrea Della Vecchia, Brian Killough, Philippe Mougnaud, Chris Lynnes, Damiano Guerrucci, Valerie Dixon, and Michael Morahan.

Action WGISS-48-09: WGISS Exec (Rob Woodcock and Chris Lynnes) to reformulate FDA-08 with a short umbrella clarifying the FDA business case and high level picture plus a set of underlying papers on specific topics (e.g. cloud-native formats, OGC-API evolutions, data cubes interoperability, and STAC). Due by December 2019.

Action WGISS-48-10: WGISS Exec (Mirko Albani and Iolanda Maggio) to define a governance process to update and maintain the OSS and FDA Elements Inventory. Due by February 2020.

Action WGISS-48-11: WGISS Exec (Iolanda Maggio) to ensure coordination of inventory activities with ongoing SLT work on UMM-S/UMM-T and with discovery/access through WGISS CDA. Due by February 2020.

# Data PRESERVATION and STEWARDSHIP



## Persistent Identifiers

Iolanda Maggio introduced the persistent identifiers session, which will address approaches and processes, documentation and software, landing page approach, and lessons learned.

### [Persistent Identifiers for ESA EO Data](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1110_Persistent-Identifiers-for-ESA-EO-Data.pptx)

Iolanda Maggio gave a presentation on Persistent Identifiers for ESA EO Data. She noted that ESA uses the DOI system, and CrossRef was selected as the Registration Agency for registering DOIs for the ESA data collections. She described the naming convention used. Currently, all ESA DOI related activities are performed manually, but shortly an ESA DOI Service will be developed to support all DOI related activities (generate, register and manage DOIs).

Iolanda stated that the convention requires that each ESA DOI must lead to a landing page that contains collection information and link to data access.

ESA is conducting a DOI awareness campaign for ESA EO data producers, Mission Managers and Mission Operations Managers.

Iolanda described a new use case, and reviewed the CEOS PI Best Practice. She listed a few updates being made:

* State that the DOI is the recommended PID system to be used.
* Add recommendation for assigning DOIs to Auxiliary/Ancillary data sets:
* assign DOI to a collection
* Change references to DataCite as the sole recommended Registration Agency to generic “Registration Agency”.
* Add recommendation that the same data set (e.g. disseminated by two different data centres) should not have two different DOIs.
* Add recommendation to include the collection DOI directly inside the products. This was accepted in the discussion.
* Updated the syntax <http://dx.doi.org/> to [http://doi.org](http://doi.org/), by removing "dx" as it should not be used anymore. It is the old syntax.

The following points were discussed:

* Dual archiving and minting a DOI (e.g. should CEDA use an ESA DOI for Sentinel data? a NASA DOI for MODIS?)
* Primary, secondary and distribution archive and responsibilities to each other (e.g. what happens when a primary archive deletes or reformats/reprocess data or adds additional data – should they notify secondary or distributions archives?)
* DOI reservation process – how and when to do it?
* Imposing bitwise fixity and when should a new DOI be minted?
* Data transfer methods between archives and data analysis platforms (important for transferring big data sets between archive and onto data analysis platforms).
* Data processing software and processing environment are relevant to data preservation. Could this best practice be extended to software/code? This [article](http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1016&context=foss4g) with title “Towards OSGeo Best Practices for Scientific Software Citation: Integration Options for Persistent Identifiers for OSGeo Project Repositories” could be a good reference.

The updated document will be circulated for review.

### [NOAA Persistent Identifiers](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1130_NOAA-Persistent-Identifiers.pptx)

Ken Casey gave a presentation on NOAA Persistent Identifiers. He began with a discussion of approaches and processes for data, documents, and software. The NOAA Data Citation Procedural Directive (PD) defines the basis for Persistent Identifiers (Digital Object Identifiers).

For the landing page approach, data DOIs link directly to a uniformly-presented landing page presenting the content of ISO 19115 metadata for the data collection. Metadata provides two-way cross-references between DATA and PUBLICATIONS (in the NOAA Central Library) when those linkages are known and documented. Publication DOIs link directly to the NOAA Institutional Repository landing page for the publication, and metadata provides two-way cross-references between PUBLICATIONS and DATA when those linkages are known and documented.

Ken noted that it is important to have a publicly-accessible policy statement to underpin the process and the basic requirements, and to review and maintain the policy statement to keep up with, and manage, expectations. Teams and working groups should be prepared to field and resolve nuanced questions about the process and policy interpretation and to communicate updates and changes widely and quickly.

### [CNES Persistent Identifiers for EO Data](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1150_CNES-DOI.pptx)

Richard Moreno described the current situation at CNES and the DOI server, followed by the French ‘Data Terra’ Research Infrastructure. Richard noted that DOI is the solution for persistent identifier at CNES though technical / organisational choices that are not frozen. The objectives are to allow concise, accurate and reliable referencing over time of data and data used for a papers/experiments. The targets are scientific articles, websites, or in the body of electronic messages.

## [Preservation Pilot Project](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1210_Preservation%20Pilot%20Project.pptx)

Mirko Albani presented the Long Lasting PiqlFilm Technology Pilot Project. He described the Piql Proof-of-Concept and the PiqlFilm technology. Mirko stated that the project with PIQL is being continued and extended to cover the following main objectives:

* Assessment of feasibility, advantages and disadvantages of storing ESA heritage missions data on PiqlFilm technology extending the analysis performed during the proof of concept to ERS, ENVISAT and GOCE heritage EO missions instruments and SOHO, GIOTTO, EXOSAT and SMART-1 heritage Science missions instruments.
* Definition of metadata model and specification of end to end procedure for storage of ESA heritage missions data on PiqlFilm.
* Imprinting of selected sample data and information from ERS, ENVISAT and GOCE missions, and of Science missions on PiqlFilm reels.
* Deposit of PiqlFilm reels in the Arctic World Archive and storage for a 10 year timeframe (minimum).
* Provision of final pilot project report and of recommendations on possible way forward for extension to a higher volume of data and a wider set of missions and instruments.

## [PV2020 Conference](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1330_PV2020-CERN-Update.ppt)

Iolanda Maggio gave a presentation describing the upcoming PV2020 Conference, to be held May 12-14, 2020. She discussed the planning tasks that are complete and the tasks yet to do. Iolanda gave the tentative meeting schedule, and listed the four sessions:

* Session 1: Ensuring long-term data and knowledge preservation (the "P" in PV);
* Session 2: Adding value to data and facilitation of data use (the "V" in PV);
* Session 3: Short - medium term issues related to policy, technology, guidelines, FAIR / TRUST principles, certification;
* Session 4: (Very) long term issues.

## [ESA EO Thesauri](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1410_ESA_Use_of_SKOS_Interface_and_Tools.pptx)

Damiano Guerrucci\* and Andrea Della Vecchia\* gave a presentation on ESA EO Thesauri. These objectives were listed:

* Common terminology to avoid naming inconsistencies about platform, instrument, instrument type and scientific keyword.
* FedEO metadata entries natively ready for being exported into DIF-10, according to both IDN metadata guideline and encoding.
* Permit metadata discovery and browse, via semantic search.

The ESA thesauri are will provide online access to Thesauri, and have similar RESTful API capabilities as the NASA GCMD. The thesauri may be realised selecting an open-source solution.

## [NOAA Maturity Matrix Self-Assessment Tool](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1410_NOAA-Maturity-Matrix-Self-Assessment-Tool.pptx)

Ken Casey gave a presentation on NOAA Maturity Matrix Self-Assessment Tool. He noted that DSMM evaluates stewardship maturity in nine key components:

* Preservability
* Accessibility
* Usability
* Production Sustainability
* Data Quality Assurance
* Data Quality Control/Monitoring
* Data Quality Assessment
* Transparency/Traceability
* Data Integrity

Ken described a streamlined assessment process that stores assessment ratings and displays them in real-time for the user. The overall rating is inserted into the collection metadata which is indexed by OneStop and displayed on the dataset landing page. In summary:

* Maturity assessment models can be used to consistently measure and present quality ratings of individual datasets.
* Structured, evidence-based, content-rich, machine- and human-readable dataset quality information can be curated systematically.
* NCEI continues to expand DSMM assessments through automation via existing tools.

Ken confirmed that the tool is not yet open source or operational.

## [EDAP: Quality Assessment Matrix](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1430_EDAP_Quality_Assessment_Matrix.pptx)

Clement Albinet\* and Paolo Castracane\* presented the ESA Earthnet Data Assessment Pilot (EDAP). The main objective of the EDAP activity is to perform early data quality assessment of existing or future missions. It will be achieved through provision of clusters of expertise in various domains. Specific focus will also be put on capacity building in the relevant data provider with the set up and evolution of documentation, tools and procedures to allow to efficiently perform data quality assessments in the domains of expertise defined within this activity.

The common framework for mission quality assessments is designed to ensure, where applicable, that community best practice is followed, and to ensure consistency of approach across project missions.

The Maturity Matrix was developed within WGISS. The maturity matrix focused on quality was developed in Climate Change (WMO). They suggested that there is a need to complement the WGISS maturity matrix with the quality aspect using the WMO maturity matrix as a baseline. Within EDAP, adaptation of the Maturity Matrix is more focused on purpose.

The following next steps were listed:

* Coordinate with international partner for finalising the approach
* Discussion (teleconference) with USGS, CISRO, NPL (IVOS), NASA (JPPG)
* Discussion/convergence at JACIE
* Presentation at WGISS (now)
* Discussion/convergence at VHR-RODA (Nov 2019) in ESRIN
* Finalisation of discussion and presentation at Next WGCV in Pasadena (March 2020)
* Merging Matrix CEOS WGCV/WGISS Sochi (Sept 2020)

## [RDA FAIR Maturity Model and Finalisation of WGISS Maturity Matrix](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1450_RDAFAIR-MM-WayForward-WGISSMM-finalization.pptx)

Iolanda Maggio gave a presentation on the RDA FAIR Maturity Model and the way forward for finalisation of the WGISS Maturity Matrix. She outlined the following WGISS needs:

* Improve the GEOSS Data Management Principles (DMP) – Implementation Guidelines (IG)
* Include FAIR Principles in GEOSS DMP-IG and WGISS Data Management and Stewardship Maturity Matrix
* Joint Activity with WGCV to improve the quality area in WGISS Data Management and Stewardship Maturity Matrix

Iolanda made a proposal for improvement of the GEOSS DMP IG using the Maturity Matrix, and possible improvements to the WMO SSM CD and the WGISS DMSMM. She suggested this way forward:

* Finalise the WGISS-WGCV Joint Activity analysis and implement the Quality improvements. Due Date: by the next WGISS-WGCV joint meeting
* Follow evolution in DSDMWG Data Sharing and Data Management Principles working groups. Due Date: Periodic Reports generation and circulation
* Follow evolution in RDA FAIR Maturity Model. Due Date: Periodic Reports generation and circulation
* Implement FAIR Final Indicator. Due Date: after RDA indicator finalisation
* Provide input to Data Management Principles – Implementation Guidelines. Due Date: When requested by GEOSS

## [AVHRR European Dataset Preservation and Valorisation Project](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1510_AVHRR_European_Data_Set.pptx)

Stefan Wunderle\* gave a presentation on the AVHRR (Advanced Very High Resolution Radiometer) European Dataset Preservation and Valorisation Project. He began with an overview of AVHRR, which has holdings since 1981. There is a high investment of ESA to keep this long-time series AVHRR data alive. The three main objectives of the project are:

* Preservation of University of Bern AVHRR data set; harmonise the data and make it accessible for future generations.
* Harmonise the ESA AVHRR data holdings (Europe) and make it accessible for users.
* Recommendations to valorise the global 1-km AVHRR data set

Stefan discussed the dataset consolidation procedure and reprocessing, and highlighted the value of the data. He stated that the length of the time series matters and suggested expanding the European ESA-archive with EO-SIP AVHRR data from University of Bern for the years 2017, 2018 and 2019 and afterwards in 3-monthly schedule. Spatial resolution also matters; suggest integrating the 1km-global data set into the ESA data archive and make it accessible as EO-SIP files. Retrieval of ECVs requires best possible pre-processing (calibration, geocoding); pre-processing can be applied on European- and Global-1km data set.

However, data from heritage sensors are often degraded and archived in different formats, and extraction of all needed information to fill the EO-SIP meta-files and quality reports are challenges that must be considered.

Stefan listed the following lessons learnt:

* A simple idea (preservation of UniBern AVHRR data and donate this unique data set to ESA) generated a very high work load, which was not expected.
* To start with level 0 data is a logical structure but is not always the right decision.
* There was a strong interest and support from ESA (namely, Sergio Folco and Razvan Cosac) which is highly appreciated.
* There is a very high interest by many users on the unique AVHRR data set (European and global) so it was a very good decision to start this project.

## [Data Preservation and Stewardship Discussion, Summary of Actions](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1530_WGISS_DSIG_Summary_Actions.pptx)

Mirko led a discussion on status of WGISS-47 actions. The following new actions were developed:

Action WGISS-48-12: Iolanda Maggio to update the Persistent Identifiers Best Practice and circulate it to WGISS by December 31, 2019.

Action WGISS-48-13: Iolanda Maggio to organise a session at WGISS-49 to discuss persistent identifiers, including use cases of DOI (i.e. software). Due by WGISS-49.

Action WGISS-48-14: Ken Casey to make a presentation at WGISS-49 to demonstrate the NOAA CoMET tool and the Maturity Matrix Self-Assessment tool. Due by WGISS-49.

Action WGISS-48-15: Mirko Albani and Iolanda Maggio to organise a teleconference/meeting with WGCV representatives to review the Maturity Matrix. Due by November 2019.

Action WGISS-48-16: Iolanda Maggio to issue the Maturity Matrix to WGISS for review by February 2020 and to request approval to finalise at WGISS-49. Due by WGISS-49.

# TECHNOLOGY EXPLORATION



## [Blockchain and Earth Observation](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1700_Blockchain-and-Earth-Observation.pptx)

Antonio Romeo\* gave a presentation on Blockchain and EO, an open distributed ledger that can efficiently record transactions between two parties in a verifiable permanent way. He listed the main concepts, benefits, limitations, and applications. Antonio noted that Blockchain is included in the European Space Technology Master Plan in 2017, in OGC, and ISO has 11 standards under development. Antonio described the following EO use cases:

* EO data and information product integrity, traceability, automated certification and auditability
* Supply chain tracking in the EO upstream segment
* Digital Identity solutions
* EO data access and trading
* Intellectual Property Rights (IPR)
* Incentives in community collaborations
* Digital representation of assets

## [NASA Earthdata Knowledge Base](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T0940_NASA_Knowledge_Graph_Prototype.pptx)

Douglas (Doug) Newman\* gave a presentation on the NASA Earthdata Knowledge Base, whose rationale is to connect the main elements of EO knowledge and context in a way that is machine-readable, human-usable and curatable. He discussed two use cases.

The approach is use graph technologies (AWS Neptune, Neo4J) with APIs (SPARQL, Gremlin, Cypher). The motivation for dataset -> documentation edges was to get to articles, since a lot of articles reference dataset documentation. The next step is to bridge that gap.

## [Data and Information Provenance in NCA4](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1000_GCIS.pptx)

Reid Sherman\* gave a presentation on data and information provenance in NCA4. He described the ideal for traceable provenance, and why it is needed. Surfacing information sources are traceable accounts, sources linked with publication metadata, and figures have data and processes documented. Each report’s provenance is connected to the same database of records, so that users can see connections across publications. For example, you can see that one person was the same person that contributed to one report and also wrote an article or was the editor on a book, etc.

GCIS planned improvements:

* Establishing metrics to measure our metadata quality
* Improving ingestion from report authors
* Implementing navigation through topical keywords
* Improving our data model and technology

## [Second Environmental Linked Features Interoperability Experiment](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1020_SELFIE.pptx)

Alistair Ritchie\* gave a presentation on the Second Environmental Linked Features Interoperability Experiment (SELFIE). The experiment is to demonstrate the use of existing and pending OGC standards for the encoding of environmental observation data in an integrated dataset of features linked according to RESTful and Linked Data principles.

Ultimately the ELFIEs are as much a social as technical engineering exercise. The domain models and advanced APIs are marvellous and necessary, but it is necessary also to support the ‘mass market’ and provide a lightweight discovering mechanism. The potential of a traversable web of distributed data and of users discovering useful tools and techniques (Geospatial APIs, the Semantic Web) may be through SELFIE.

## [OGC API - Features: A Resource-Oriented Alternative to WFS](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1100_OGC_API_Feature.pptx)

George Percivall\* gave a presentation on OGC API - Features: a resource-oriented alternative to WFS. He discussed the OGC API roadmap, access to collections of features, and API features implementations.

## [STAC – Spatiotemporal Asset Catalog](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1120_STAC_Spatiotemporal_Asset_Catalog.pdf)

Dan Pilone\* gave a presentation on SpatioTemporal Asset Catalogues (STAC). STAC is JSON defined metadata for geospatial catalogues and assets, dynamic APIs, and static catalogues. Dan described the specifications for catalogues, collections, and items.

Dan also discussed creating STAC metadata, and using STAC and cloud-optimised data.

## [Technology Exploration Discussion, Summary of Actions](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1140_WGISS_Technology_Summary_Actions.pptx)

Valerie led a discussion on status of WGISS-47 actions. The following new actions were developed:

Action WGISS-48-17: WGISS Exec to assess Blockchain as a potential topic for the Technology Exploration Interest Groups and see if there is interest in WGISS to proceed with it further. Due by February 2020.

Action WGISS-48-18: WGISS Exec to develop a plan/solicit volunteers to write sections of the Future Data Architecture Whitepaper as it applies to STAC/OGC-API/Datacube interoperability), now that IDN (through CMR) has a STAC API (OGC WFS 3.0-compliant). Due by January 2020.

Action WGISS-48-19: Technology Interest Group to explore the possibility to organise a dedicated session on ARD products SW and tools at WGISS-49. Due by WGISS-49.

# Agency and Liaison Reports



## [ISO 19165-2 Liaison Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T0930_ISO_19165-2_Standard_Status.PPTX)

Hampapuram (Rama) Ramapriyan\* gave a liaison report on ISO 19165-2: Geographic information -- Preservation of digital data and metadata -- Part 2: Content specifications for Earth observation data and derived digital products. He gave the background referencing ISO 19165-1, and described the need for ISO 19165-2. ISO 19165-2 is based heavily on prior work in Europe, the US and WGISS:

* US – NASA/NOAA/ESIP – Provenance and Context Contents – listing
* Europe (ESA) – Long-Term Data Preservation (LTDP) Program documents
* US – NASA – Earth Science Data Preservation Content Specifications
* CEOS/WGISS - Earth Observation Preserved Data Set Content (PDSC)

Rama concluded with the steps in arriving to an ISO standard. ISO 19165-2 is now a Draft International Standard (DIS) and is being voted on by the member nations regarding proceeding to the final step of making it an international standard.

Rama clarified that 19165-2 has more contextual information, and should be issued by early to mid-2020.

## [ISO TC 211 Liaison Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T0945_ISOTC211-Report.ppt)

Liping Di gave a liaison report on ISO TC 211. He began describing the organisation, composition and scope of TC211. Liping continued with a list of ISO TC 211 metadata standards published in 2019, and on-going imagery and gridded data standards projects related to WGISS:

* ISO 19123-1 Coverage – Part 1: Fundamentals
* ISO 19130-3 Geographic information – Imagery sensor models for geopositioning - Part 3: XML schema implementation
* ISO 19150-4 Geographic information - Ontology, Part 4: Service ontology
* ISO 19159-4 Calibration and validation of remote sensing imagery sensors and data -- Part 4: Passive Microwave Sensors
* ISO 19124: Calibration and validation of remote sensing data and derived products (being proposed)

Liping concluded saying that CEOS WGISS can contribute significantly to ISO standards development, especially in remote sensing and data systems. He will need WGISS input if to give a liaison report at the 49th ISO TC 211 plenary.

It was noted that ISO 19124 might be an area for collaboration with WGCV.

## [UKSA Agency Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1000_UKSA_Liason_Report.pptx)

Esther Conway\* gave an agency report on UKSA. She described the Sentinel Data Access Service (SEDAS), and the UK collaborative ground centre, NOVASAR, SSGP – High resolution data.

UKSA recognises that partnership is key, and is active in the UK-China Newton Fund, the NCEO ODA Programme working with Ghana, Kenya, and SE Asia. She also discussed the Internal Partnership Programme to fund projects which use cutting-edge UK satellite expertise to support developing nations by delivering a practical impact on the ground. Some IPP project examples are:

* Informing placement of renewable energy assets
* Providing farmers with field-level agricultural information
* Monitoring deforestation around the world
* Monitoring dams to avoid failures
* Providing internet access to rural schools
* All projects use satellite solutions

## [JAXA Agency Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1010_JAXAAgencyReport.pdf)

Makoto Natsuisaka gave an agency report on JAXA. He described the JAXA EO utilisation strategy for national security, disaster risk management, and climate change. Makoto announced the GCOM-C product release (some are ECVs) and the GOSAT-2 “IBUKI-2” L1B product release.

Makoto stated that the EO Portals distributing JAXA satellite data include the G-Portal, JASMES, GSMaP, GDAS (NIES: National Institute for Environmental Studies service), J-CORE, and the METI (Ministry of Economy, Trade and Industry) open and free platform, “Tellus”. He displayed the long-term mission plan of developing four new satellites and described JAXA’s cooperation with CEOS. JAXA considers GEO/CEOS portals as primary gateways to the global users and has already connected G-Portals with GEOSS portals through IDN and FedEO. JAXA registered DIF-10 to IDN and updated it to add GCOM-C information.

Nitant asked the availability of Tellus. Makoto replied that it is operational; it is a cloud service and users can access analyses but cannot download original data. Data access is through G-Portal. Michael asked how IDN will get the information; Makoto replied that it is being done in cooperation with FedEO.

## [CNES Agency Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1020_CNES-agency-report.pptx)

Richard Moreno gave an agency report on CNES. He described the French Research Infrastructure ‘Data & Services for the Earth System’, giving the context, goals, and main issues. The infrastructure is built on four data and services centres: Solid Earth, atmosphere, ocean, and continental surfaces.

Richard noted that the CNES data policy is undergoing change, and he expects that access quotas will be used, such that when a quota is exceeded a project will be discussed. To be cost efficient, they have three levels of service: basic, standard, comprehensive.

## [NASA Agency Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1030_NASA-Report.pptx)

Andy Mitchell gave an agency report on NASA. He began with a listing of the Earth science data system program major components, and displayed an image showing the NASA Earth Fleet, the instruments on the International Space Station, and the collaboration missions. Andy described the role of the Earth Science Data Systems Program (EOSDIS), and listed the core services and components, and data access (Earthdata.nasa.gov).

Andy also discussed Earthdata Cloud, which is changing the architecture to a simplified commercial cloud architecture, with cost controls on egress. The project is prioritising EOSDIS data products for cloud migration.

## [ESA Agency Report](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/3.%20Thursday%20October%2010/20191010T1040_ESA-Agency-Report.pptx)

Mirko Albani gave an agency report on ESA. He described the Earth observation missions of ESA, and the plan to preserve the data, making it discoverable and accessible to all users with the latest tools and technologies.

Mirko described the main points of the Copernicus space component, detailing information on the various Sentinels and the value provided by these data to investigators.

# WGISS Plenary, Part II



## [Future Meetings](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1220_Future_Meetings.pdf)

Robert Woodcock gave information on upcoming WGISS meetings.

WGISS-49 will be hosted by CONAE, and held in Buenos Aires, Argentina, April 20 to 23, 2020. Rob described the venue, travel logistics, and suggested accommodations.

WGISS-50 will be held jointly with WGCV in Sochi, Russia, September 21 to 24, 2020.

## CEOS Working Groups Reports and Progress on Cooperation with WGISS

### [WGCV](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1330_WGCV.pptx)

Cindy Ong\* gave a report on WGISS-WGCV cooperation. She began with background on WGCV, and status of WGCV’s contribution to the CEOS Work Plan. She reviewed several projects.

Cindy reminded that in April 2018 four topics were identified for cooperation between the two working groups, with leads from WGISS and WGCV. Several joint teleconferences and meetings have been held since then. The four topics are:

* Data Formats and Interoperability in the framework of FDA -Robert Woodcock (WGISS), Medhavy Thankappan (WGCV)
* Quality Indicators in Discovery Metadata - Michael Morahan (WGISS), Nigel Fox (WGCV)
* CEOS Data Cubes and CEOS Test Sites Data Access in support of WGCV Activities - Robert Woodcock (WGISS), Greg Stensaas (WGCV)
* Standardisation and Best Practices (e.g. ISO 19159-3) - Richard Moreno (WGISS), Cindy Ong (WGCV)

Cindy proposed the convergence of tasks 1, 2, and 4, and of 1 and 3.

Mirko commented that it is a good message for the Plenary that data cubes can be helpful to WGCV activity.

### [WGCapD](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1350_WGCapD.pptx)

S. P. Aggarwal\* gave a presentation on WGCapD. He described the working group’s objectives and members. Their activities include e-learning (webinars and MOOCs) and workshops (EO, thematic, regional workshops). S. P. discussed a number of their accomplishments with workshops and trainings, including the FDA Awareness Webinar presented in cooperation with WGISS.

Mirko congratulated them on all their accomplishments and appreciated their cooperation with the FDA webinar.

### [WGClimate](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1410_WGClimate.pptx)

Joerg Schultz\* gave a presentation on WGClimate. He described the architecture for climate monitoring in space, and listed the working group’s major objectives and recent achievements. He described the setup and benefits of the GCOS ECV CDR Inventory, and the gap analysis performed. Joerg detailed the following interactions with WGISS, and Mirko agreed to review these three cooperative activities.

* Metadata alignment for IDN registration of ECV data records: Action DATA-9-Facilitating discoverability and accessibility of ECV Products and space-born CDRs relevant for the CEOS Carbon Action via WGISS Interoperability Systems and Standards (FedEO/CWIC/IDN, OpenSearch). After the WGClimate-10 in March 2019, WGISS analysed ECV Inventory 2.0 (available on climatemonitoring.info) to assess the overlap and adequacy of information to be potentially harvested from the ECV Inventory to fulfil part of the requirements of the IDN database; four issues for detected, not all of them have been resolved.
* The WGISS Carbon Portal and how to use and further evolve it. Received a presentation at WGClimate-11 and liked the tool and see lots of potential to use it for all CEOS Carbon Activities to create a shopping window for the related data – will discuss this further at WGClimate-12 in Q1/2020;
* May work together on analysing automation potential for ECV Inventory population.

Joerg listed the following issues; Mirko agreed to review these internally, noting that WGISS has requested to postpone the task by six months.

* ISSUE-1: Geographic extension provides free text, not convention seems to be adopted, not machine readable – Solved in Inventory 3.0
* ISSUE-2: Platform/instrument information merged (see Column AJ of ECV spreadsheet, row 3 NOAA-10-HIRS/2). – This seems is only an Excel export problem
* ISSUE-3: Platform and instrument names (column AJ) may be slightly different from GCMD vocabulary – Can provide you a dump of the WMO/OSCAR database that contains the names we used
* ISSUE-4: Multiple organisations may appear in a single column, but separator is not consistent or not always separating different organisations. Similarly to ISSUE-2, it is not clear how to split the several collection organisation in column N (e.g., NASA – NOAA – EUMETSAT – CNES, etc.) - requires a change to our web interface that may be implemented only for v4 (should contain drop-down list of Agencies would make our life easier, also for our own reporting.
* ISSUE-5: WGClimate has no resources at the moment to address this, proposed postponement of the Action by six months.

Stefan Wunderle commented on the gap analysis report. Joerg replied that WGClimate has started a discussion for new definitions of climate data records, and how to achieve them. A proposal is on the table, and they are writing a community paper that will be submitted for broad review.

### [SDG AHT](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1430_SDG-AHT.pptx)

Marc Paganini\* gave a presentation on CEOS AHT Sustainable Development Goals. He began with the background of the AHT SDG, which shall assess, showcase and promote EO contribution to SDG Targets and Indicators.

Marc discussed commonly stated obstacles to the scaling-up and operational use of EO in the global sustainable development agenda. As a demonstration of the effectiveness of the streamlining measures, the SDG AHT proposes to start with the three SDG indicators that are most ready to integrate EO in their processes. These three indicators are also the primary indicators selected by the IAEG-SDGs WGGI for the Task Stream on satellite Earth Observation data for the SDG indicators.

Marc outlined the following SDG and WGISS collaboration:

* Review of the EO-enabling infrastructures (software toolboxes, cloud processing platforms, EO data processing and analytics tools including data cubes) available in CEOS agencies and which can facilitate the uptake of satellite observations by SDG stakeholders
* Development of a CEOS SDG Community Portal for discovery of and access to satellite ARD and EO data sets, based on WGISS Connected Data Assets. (IDN, CWIC, FedEO)
* Capacity Building webinars/training on advanced satellite-based methodologies for SDG indicators, including the use of EO enabling infrastructures

Robert Fletcher asked how UKSA can participate; Marc replied that there will be a call for support at the CEOS Plenary. Mirko commented that the inventories have circulated and are being made available.

Mirko suggested that it would be helpful to have the list of datasets for SDGs

### CEOS Working Groups Cooperation Discussion, Summary of Actions

The following actions resulted from this session:

Action WGISS-48-20: WGISS Exec to consider having a joint workshop with GEOSS at WGISS-49. Due by WGISS-49.

Action WGISS-48-21: Andrea Della Vecchia and Michael Morahan to analyse feedback from WGClimate for IDN registration (see Joerg Schultz slides) and check if registration can be completed or we need additional feedback or to wait ECV inventory update V4. Due by November 2019.

Action WGISS-48-22: Liping Di and Ken Casey to check with Joerg Schultz if an additional Carbon Portal Demo / Presentation is needed at WGClimate-12 in Q1-2020. Due by January 2020.

Action WGISS-48-23: DSIG to consider updating the WGISS Glossary of Terms to add ECV definitions and other interoperability-related terms to help in communicating with external entities: cooperation with WGClimate/LSI-VC/WGCV. Due by January 2020.

## [WGISS Summary](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/4.%20Friday%20October%2011/20191011T1530_WGISS%20Chair%20Summary.pptx)

Mirko Albani summarized the WGISS-48 meeting with the following points and topics discussed:

1. Dr. Vu Anh Tuan provided a description of VNSC and its activities.
2. WGISS Chair: Feedback from 2019 SIT TW, potential actions/deliverables for WGISS.
3. SEO: Report on COVE and ODC, data pipeline and format open questions.
4. CEO: CEO 2020 vacancy; CEOS 2020-21 Work Plan.
5. WISP: Tasks will be covered by Secretariat and SEO; WISP project will be terminated.
6. ISO 19165-2: Draft International Standard ballot initiated, final version published next year.
7. ISO TC 211: Several standards under development; possible cooperation with WGCV.
8. GEO
   * GEO Work Programme 2020-22 approval at GEO Plenary
   * Finalization of Draft Implementation Plans for Work programme Tasks and Activities
   * Announcement on nomination procedure for Task Teams and Working Groups associated with Foundational Tasks after WP approval.
   * Action Item for WGISS Exec: await announcement and submit WGISS PoC candidature as agreed.
9. Discussion on cooperation with other groups: WGCV, WGClimate, WGCapD, SDG AHT
10. Agency reports: NASA, JAXA, CNES, UKSA, ESA
11. CEOSS 33rd Plenary announcement
12. Data Discovery and Access
    * WGISS Data Assets: Improve user search; CEOS branding, same look and feel
    * NESDIS Cloud roadmap
    * GEOSS Portal
    * OGC 19-020: Testbed-15 Service Discovery
13. Tools and Services: Worth to share information on services and tools discovery/access at WGISS (CDA), OGC, GEOSS, CEOS Agencies. Dedicated workshop/session at WGISS-49, and new subgroup to be formed under Interoperability and Use
14. Data Interoperability and Use
    * NASA
    * OPeNDAP in the Cloud
    * UK ARD
    * The Global Carbon Project
    * ONDA
    * Vietnam Data Cube
    * Web Feature Service 3.0
    * CREODIAS
    * Inventory of FDA elements and OSS
    * Data Cubes convergence/similarities/interoperability: UK initiatives, CEOS ODC, Euro DC, ESA PDGS DC
15. Data Preservation and Stewardship
    * Persistent identifiers reports/discussion from ESA, CNES, and NOAA
    * NOAA Maturity Matrix: Data Stewardship Maturity Questionnaire/Rating/Tool
    * SKOS use at ESA and ESA Thesauri
    * Earthnet Data Assessment Pilot: contribution to WGISS Maturity Matrix as joint WGCV/WGISS activity
    * RDA FAIR: Improvement of WGISS Maturity Matrix, final issue by end Feb 2020.
    * AVHRR: Longest time/geographical European coverage
16. Technology Exploration
    * Blockchain
    * SELFIE
    * Knowledge Graph
    * Linked Data
    * OGC APIs
    * STAC
17. Incoming Chair and Vice-chair:
    * Dr. Robert Woodcock (CSIRO)
    * Dr. Makoto Natsuisaka (JAXA)

## [WGISS-48 Actions](http://ceos.org/document_management/Working_Groups/WGISS/Meetings/WGISS-48/Actions.docx)

Michelle Piepgrass summarised the following actions resulting from the meeting:

**General**

Action WGISS-48-01: WGISS Exec to consider creation of a subgroup under the Data Interoperability and Use Interest Group to focus on “Services and Tools: discovery, access and interoperability”. Due by end 2019.

Action WGISS-48-02: WGISS Exec to await GEOSEC announcement and submit nomination of WGISS point of contact in GEO WP Foundational Tasks. Due by end 2019.

Action WGISS-48-03: WGISS Exec to review and comment potential Actions on WGISS in the new CEOS Work Plan 2020-22 in relation to ARD Strategy. Due by February 2020.

**Data Discovery and Access**

Action WGISS-48-04: Michelle Piepgrass to discuss with Brian Killough the possibility of restoring the URL wgiss.ceos.org since it is referenced in several brochures. Due by November 2019.

Action WGISS-48-05: WGISS CDA-SLT to organise a session at WGISS-49 on services discovery and access with the goal to align the approaches of OGC, CDA, and GEO. Due by WGISS#49.

Action WGISS-48-06: WGISS CDA-SLT to review VC data collection inventories spreadsheet and confirm if/what information is missing to generate DIF-10 metadata for the datasets therein included. Due by December 2019.

Action WGISS-48-07: WGISS CDA-SLT to prepare a template for VC Leads to gather information for IDN registration. Ask for specific needs (e.g. One-stop-shop data discovery and access for relevant data sets and tools? Community portals?). Due by December 2019.

**Data Interoperability and Use**

**Action** WGISS-48-08: WGISS Interoperability Tiger Team to follow-up interoperability activities between data cubes as defined in the roadmap outlined in the WGISS#48 session (including definition of relevant milestones). The team will include Rob Woodcock (Lead), Andrea Della Vecchia, Brian Killough, Philippe Mougnaud, Chris Lynnes, Damiano Guerrucci, Valerie Dixon, and Michael Morahan.

Action WGISS-48-09: WGISS Exec (Rob Woodcock and Chris Lynnes) to reformulate FDA-08 with a short umbrella clarifying the FDA business case and high level picture plus a set of underlying papers on specific topics (e.g. cloud-native formats, OGC-API evolutions, data cubes interoperability, and STAC). Due by December 2019.

Action WGISS-48-10: WGISS Exec (Mirko Albani and Iolanda Maggio) to define a governance process to update and maintain the OSS and FDA Elements Inventory. Due by February 2020.

Action WGISS-48-11: WGISS Exec (Iolanda Maggio) to ensure coordination of inventory activities with ongoing SLT work on UMM-S/UMM-T and with discovery/access through WGISS CDA. Due by February 2020.

**Data Preservation and Stewardship**

Action WGISS-48-12: Iolanda Maggio to update the Persistent Identifiers Best Practice and circulate it to WGISS by December 31, 2019.

Action WGISS-48-13: Iolanda Maggio to organise a session at WGISS-49 to discuss persistent identifiers, including use cases of DOI (i.e. software). Due by WGISS#49.

Action WGISS-48-14: Ken Casey to make a presentation at WGISS-49 to demonstrate the NOAA CoMET tool and the Maturity Matrix Self-Assessment tool. Due by WGISS#49.

Action WGISS-48-15: Mirko Albani and Iolanda Maggio to organise a teleconference/meeting with WGCV representatives to review the Maturity Matrix. Due by November 2019.

Action WGISS-48-16: Iolanda Maggio to issue the Maturity Matrix to WGISS for review by February 2020 and to request approval to finalise at WGISS-49. Due by WGISS#49.

**Technology Exploration**

Action WGISS-48-17: WGISS Exec to assess Blockchain as a potential topic for the Technology Exploration Interest Groups and see if there is interest in WGISS to proceed with it further. Due by February 2020.

Action WGISS-48-18: WGISS Exec to develop a plan/solicit volunteers to write sections of the Future Data Architecture Whitepaper as it applies to STAC/OGC-API/Datacube interoperability), now that IDN (through CMR) has a STAC API (OGC WFS 3.0-compliant). Due by January 2020.

Action WGISS-48-19: Technology Interest Group to explore the possibility to organise a dedicated session on ARD products SW and tools at WGISS-49. Due by WGISS-49.

**Working Groups Cooperation**

Action WGISS-48-20: WGISS Exec to consider having a joint workshop with GEOSS at WGISS-49. Due by WGISS-49.

Action WGISS-48-21: Andrea Della Vecchia and Michael Morahan to analyse feedback from WGClimate for IDN registration (see Joerg Schultz slides) and check if registration can be completed or we need additional feedback or to wait ECV inventory update V4. Due by November 2019.

Action WGISS-48-22: Liping Di and Ken Casey to check with Joerg Schultz if an additional Carbon Portal Demo / Presentation is needed at WGClimate-12 in Q1-2020. Due by January 2020.

Action WGISS-48-23: DSIG to consider updating the WGISS Glossary of Terms to add ECV definitions and other interoperability-related terms to help in communicating with external entities: cooperation with WGClimate/LSI-VC/WGCV. Due by January 2020.

## Concluding Remarks

Mirko Albani thanked Chieu Linh Phan Ngoc and Dr. Vu Anh Tuân for their efficient, generous, and wonderful hosting of the meeting. He also thanked all the participants, and looks forward to seeing them at WGISS-49.

# Glossary of Acronyms

API Application Programming Interface

ARD Analysis Ready Data

AWS Amazon Web Services

CEO CEOS Executive Officer

CEOS Committee on Earth Observation Satellites

CSW Catalogue Service for the Web

CWIC CEOS WGISS Integrated Catalogue

DC data cube

DIF Directory Interchange Format

DOI Digital Object Identifier

DSMM Data Stewardship Maturity Matrix

ECV Essential Climate Variable

EO Earth Observation

FAIR Findable, Accessible, Interoperable, Reusable

FDA Future Data Architectures

GCI GEOSS Common Infrastructure

GCIS Global Change Information System

GCMD Global Change Master Directory

GEO Group on Earth Observations

GEOSS Global Earth Observation System of Systems

GIS Geospatial Information System

GPU Graphics Processing Unit

GSDI Global Spatial Data Infrastructure

GUI Graphical User Interface

IDN International Directory Network

ISO International Standards Organisation

OGC Open Geospatial Consortium

OSS Open Source Software

PI Persistent Identifier

SEO Systems Engineering Office

SDCG Space Data Coordination Group

SDG Sustainable Development Goals

SIT Strategic Implementation Team

SLT System Level Team

SWG Standards Working Group

UML Unified Modelling Language

UMM Unified Metadata Model

VC Virtual Constellation

WCS Web Coverage Service

WG Working Group

WGCV Working Group on Calibration and Validation

WGCapD Working Group on Capacity Building & Data Democracy

WGClimate Working Group on Climate

WGDisasters Working Group on Disasters