

Proposed 2017 CEOS Chair Initiatives

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Introduction

As the 2017 CEOS Chair Agency, the USGS will provide leadership on a number of initiatives in support of CEOS objectives. To ensure continuity and coherence of CEOS activities, USGS will first aim to ensure that the priorities and themes identified by the current Chair (CSIRO) and the current SIT Chair (ESA) are supported and further developed through 2017. This includes the next steps on the two *ad hoc* teams which have been operating in 2016 to explore specific topics (see 1 and 2 below). These teams will report on their efforts at the Brisbane CEOS Plenary in November, and the USGS will support the next steps resulting from discussion of their conclusions and recommendations.

This short paper aims to communicate to the CEOS community the USGS proposals for its activities and priorities as Chair in 2017, serving as a focus for discussion going forward to the CEOS Plenary. The USGS aims to establish support and consensus among CEOS agencies for these proposals and to obtain feedback to best shape and direct the plans for 2017.

Context

A number of initiatives and themes have been established by CSIRO and ESA in 2016 in the conduct of their CEOS leadership roles, including:

1. A study of future data access and analysis architectures.
2. A study of non-meteorological applications for next generation geostationary satellites.
3. Consideration of future partnerships and priorities for CEOS, notably with GEO, the UN system, development banks, and the *big data* players.
4. Expediting existing CEOS thematic acquisition strategies – in relation to forests, agriculture, disasters, climate, carbon, and water.

As 2017 CEOS Chair, the USGS will work with CSIRO, ESA, and the relevant stakeholders to ensure the required continuity. Given the relevance to several core programs of the agency, the USGS plans to prioritize a number of topics currently under study within the Future Data Architectures *ad hoc* team, which have rapidly increasing interest and related activities underway within CEOS and its agencies. The latest FDA report and its initial recommendations may be referenced for additional details.

These fundamental and enabling technologies have significant promise in supporting the broader uptake and application of CEOS agency EO satellite data and in helping this data realize its full potential in support of society. The USGS has already committed to an information strategy within the agency for the Landsat series that will feature both ARD and Data Cubes as core elements. The USGS will seek to leverage internal activities and capacities in this direction for the benefit of the equivalent CEOS initiatives. Along with commitments to free, open, and sustained supply from both US and European agencies, the USGS is convinced that these activities will ensure that the next era for Land Surface Imaging applications can have maximum impact.

In this information-rich society, EO satellite data must compete with easily-accessible and easily-ingested sources of data and information. Sophisticated EO data visualisation and analysis systems provided by the *big data* industry players are (rightly) raising expectations of users as to how easy it could and should be to access and apply EO satellite data. It should not require an advanced degree for users to be able to integrate CEOS agency data into their applications and systems. Removal of the complexity and difficulty of handling large and technical data sets, often with unique quirks and characteristics, is essential for government-sponsored EO satellite programs to maximize their impact in society. Investment in ARD and the CEOS Data Cube (CDC) can help CEOS realize a future

which is information-focused and sensor-agnostic and where the user can create new and powerful applications that make maximum use, with minimum effort, of the more frequent coverage available from sensors provided by a range of CEOS agencies.

Recognizing the increasing number of bottom-up initiatives in this direction within individual CEOS agencies and initiatives, as 2017 CEOS Chair the USGS will aim to establish a broader perspective and engagement to ensure that all necessary coordination and standardization opportunities are exploited for maximum benefit.

A number of studies have been underway in 2016 that will inform the discussion anticipated at the CEOS Plenary in relation to the next steps suggested above, including the *ad hoc* team study of future data access and analysis architectures and the Global Data Flows study by the SDCG for GFOI. These studies may also raise specific ideas and proposals that should be taken into account. Without prejudice to these processes or their outcomes, the USGS proposes to pursue the following two initiatives through 2017:

1. Future Data Architectures Continuation
2. Moderate Resolution Sensor Interoperability

Initiative #1: Future Data Architectures Continuation

Future Data Architectures Continuation will likely include:

- a. Finalization of the CEOS ARD definition initiated by the SEO and now being led by LSI-VC.
- b. Actions to support the development, production of, and access to compatible ARD from multiple CEOS agencies. A future where CEOS agency ARD data is widely available will be reached step by step, and initial efforts might focus on a particular application or demonstration to help persuade agencies and users of the merits and potential. All within a clearly-articulated framework of an overall CEOS strategy for ARD.
- c. Informal coordination and consultation with the *big data* players to maximize their uptake of CEOS agency ARD in their systems.
- d. Advance the draft CEOS Data Cube 3-Year Work Plan and establish the institutional arrangements and leadership for its implementation. Propose tasks within the 3-Year Work Plan to ensure development and maintenance of the necessary open source software on which the CEOS Data Cube and related user tools will be based.
- e. Further development of existing CDC and ARD prototypes for GFOI/GEOGLAM (e.g., Colombia) to explore potential for CEOS agency purposes.
- f. Consideration of actions to address issues raised by the GFOI Global Data Flows study in 2016 and the feedback from countries, intermediaries such as FAO, and the World Bank, considering how new tools and architectures might help uptake of EO satellite data by more countries for more purposes.
- g. As capabilities evolve and capacity develops, CEOS must establish an understanding of how these technologies are best deployed in support of CEOS and agency objectives. This may include a blend of global networks (including those of the *big data* players in industry), regional hubs, and national Data Cubes. Small-scale experiments will be required to provide convincing demonstrations and develop broad support among CEOS agencies.

Initiative #2: Moderate Resolution Sensor Interoperability

This initiative will include effort towards making optimal use of the increasing number of data streams available in the moderate resolution class, with a focus for 2017 on Landsat/Sentinel-2. Foundational efforts are already underway to ensure interoperability (e.g. MuSLI), and include pre-

flight and on-orbit cross-calibration of Sentinel-2 carried out by NASA, USGS, and ESA. As Sentinel-2's product generation pipeline develops and is implemented, a need for higher level coordination exists, in particular to ensure agency commitments to support the generation of interoperable products on an operational basis. Two important activities are foreseen for this effort in 2017:

- a. Defining a framework for moderate resolution interoperability. This definition should be generally applicable (i.e. beyond Landsat/Sentinel-2) and should address factors such as radiometry, geometry, data formats, browse, metadata, data access, metrics, and reporting.
- b. Completion of a case study focused on Landsat-Sentinel-2 interoperability. In the context of the framework defined above, this case study should seek to document, publish, and communicate clearly to the community the objectives and intended uses of the interoperable products, the products desired, previous and ongoing activities supporting product development, a current status of these activities (as of end 2017), and map the way forward. The way forward should identify the main actors, programs and existing activities to be leveraged, gaps in the existing plans, and should detail dependencies and assumptions about agency plans for standard product generation. This case study should be conducted in concert with the CEOS Working Group on Calibration and Validation (WGCV), the CEOS Working Group on Information Systems & Services (WGISS), and their associated activities. Within the available resources available, other CEOS agency case studies will also be welcomed.