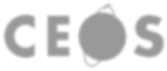
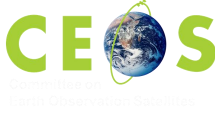
CEOS Analytics Lab & Commerical 

Interoperability 

Study

David Borges

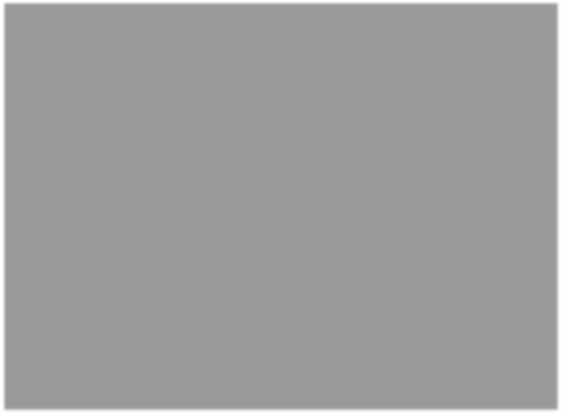
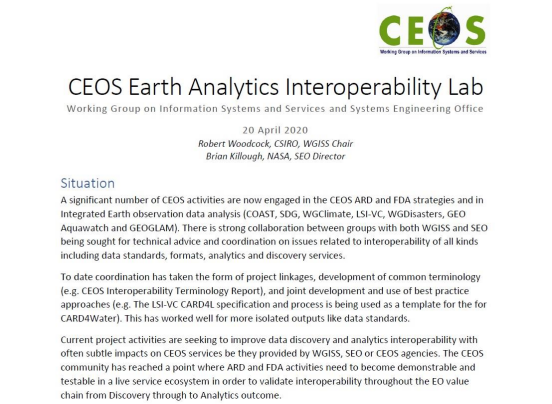
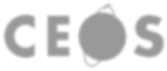
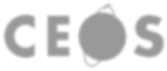
Systems Engineering Office

Committee on Earth Observation Satellites 

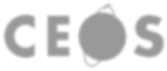
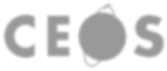
NASA Earth Science Division

LSI-VC-15 Agenda 3.1

05 April 2024

CEOS Earth Analytics Interoperability Lab

**Slide 2**

CEOS Analytics Lab **c e o s . o r g / c a l**

**Slide 3**

Analytics Lab Architecture

❖Analytics Lab is an implementation of CSIRO’s Earth Analytics Science and Innovation platform (EASI)

❖Combination on several open-source projects:

▪ JupyterHub

▪ Open Data Cube

▪ AWS

▪ Dask scaling

❖Scales individual user environments on demand.

❖Analysis can scale beyond the user environment using Dask workers that are used only when the analysis is run.

**Slide 4**

Commercial Interoperability Project • CEOS New Space Task Team (NSTT) Deliverable

*D5) SEO should demonstrate the integration of New Space data into CEOS Analytics Lab and evaluate its interoperability with common CEOS datasets.*

• Optical

• Landsat 8, 9

• Sentinel-2

• Maxar

• Planet Planetscope • DESIS

• SAR 

• Sentinel-1 • ALOS

• Umbra

• ICEYE

• Capella

**Slide 5**

Commercial Interoperability Study Value ❖ Importance: 

▪ Improve understanding of commercial image quality as compared to public imagery datasets

▪ Evaluate cross-platform interoperability and

accessibility of commercial datasets

▪ Explore challenges of working with data from both commercial and public platforms

▪ Understand workflows necessary to incorporate multiple data sources

▪ Provide a foundation of knowledge to promote increased use of commercial data

▪ Formulate future recommendations for guiding CEOS policy regarding commercial data

▪ Test usage on the CEOS Analytics Lab (CAL) and the Open Data Cube

▪ Delineate Interoperability of Systems vs Data

**Slide 6**

CEOS-SEO Preliminary Interoperability Analysis Sources 

❖ Level 2A Data (Monthly Comparisons, 2018-Present):

| **Commercial Platforms Public Platforms** | |
| --- | --- |
| Planet Dove/SuperDove | Landsat 8/9 |
| Maxar WorldView-02/03 | Sentinel 2 |
| Teledyne DESIS | HLS |

❖ Cal/Val Sites

| **Cal/Val Sites** Northern Hemisphere Radiometric Railroad Valley Playa (Nevada, USA) | Southern Hemisphere  Gobabeb  (Namibia, Africa) |
| --- | --- |
| Lake Ponchartrain  Spatial  Causeway  (Louisiana, USA) | Suramadu Bridge  (Indonesia, Asia) |



**Railroad Valley Lake Pontchartrain**

**Bridge Gobabeb** 

**Suramadu Bridge**

**Slide 7**

Commercial Interoperability Project • Technical Approach

• Data Access

• Evaluate use of commercial providers APIs (not all include API access) • Implement APIs to access data

• Data Loading

• Generate ODC indexing scripts for each commercial provider • Create demo indexer notebooks

• Analysis / Visualization

• Build notebooks evaluating:

• Pixel-by-pixel scatter plots comparing individual bands

• Inherent harmonization evaluation

• Resampling analysis

• Band to band spectral comparison

• OUT-23-05/06: NASA/ESA Mission Quality Assessment Framework Guidelines (optical & SAR)

**Slide 8**

Commercial Interoperability Project• Key Considerations and Challenges (Optical)

• Sensor Variation

• Impacts spectral band alignment, spatial detail, signal strength • Processing Biases

• Differences in atmospheric correction and vendor-specific sharpening will influence direct comparisons

• Situational Factors

• Slight time offsets and viewing geometry differences create irreducible limitations

• Commercial data compliance with CEOS-ARD PFS

**Slide 9**

Commercial SAR – SEO Assessment

Increase in small commercial “New Space” SAR companies 

❖ X-band SAR systems

❖ Light-weight, low cost

❖ Large satellite constellations (10~50 satellites) ❖ Very high spatial resolution (0.2~2 m)

❖ Very high temporal revisit capacity (daily/sub-daily) ❖ Main market segment: defence, security

❖ Targeted observations per user requests

❖ Strategic background observation plans - probably not



Current (SAR) actors:

❖ Capella Space (USA) [9] ❖ ICEYE (Finland) [32] ❖ iQPS (Japan) [3] 

❖ Synspective (Japan) [2] ❖ Umbra (USA) [7]

❖ Others?...

Image credit: Synspective Image credit: iQPS Image credit: ICEYE Image credit: Capella Image credit: Umbra

**Slide 10**

Commercial SAR – SEO Assessment SEO assessment (sample data)

❖ Data quality

▪ Geometry, Radiometry ❖ User friendliness

▪ Product levels

▪ Documentation

❖ Data accessibility

▪ Sample data

▪ Data for purchase

❖ CEOS-ARD

▪ Interest & relevance in providing CEOS-ARD product levels

▪ Mock (self-)assessment of sample products ❖ CEOS Analytics Lab (CAL)

▪ Feasibility for inclusion of sample data ▪ Additional processing?

Image credit: Synspective Image credit: iQPS Image credit: ICEYE Image credit: Capella Image credit: Umbra

**Slide 11**

CEOS Community Cal/Val Preliminary Findings & Opportunities 

**Preliminary Findings:**

❖ Most commercial data doesn’t meet threshold CEOS ARD requirements

❖ CEOS Cal/Val Portal

▪ Some information is deprecated

▪ Could use improved navigation clarity and page overviews

❖ RadCalNet only has manual data access

❖ Clarity on commonly accepted CEOS standards and practices for Calibration and Validation

❖ Only one high resolution spatial test target on ECCOE - Baotou test site

**Cal/Val Opportunities:**

❖ Addition of API access to RadCalNet ❖ Development of automated Cal/Val systems based on CEOS approved methods

**Commercial Data Opportunities:** ❖ Work with commercial providers to conform with CEOS ARD Standards ❖ Work with providers to better document their calibration and validation processes

❖ Continue developing tools to index commercial data on the ODC

**Slide 12**

CEOS Outreach Efforts

• SatSummit 2024 

• Washington, D.C.

• 16-17 May

• IGARSS 2024: CEOS Booth • Athens Greece 

• 7-12 July

**Slide 13**