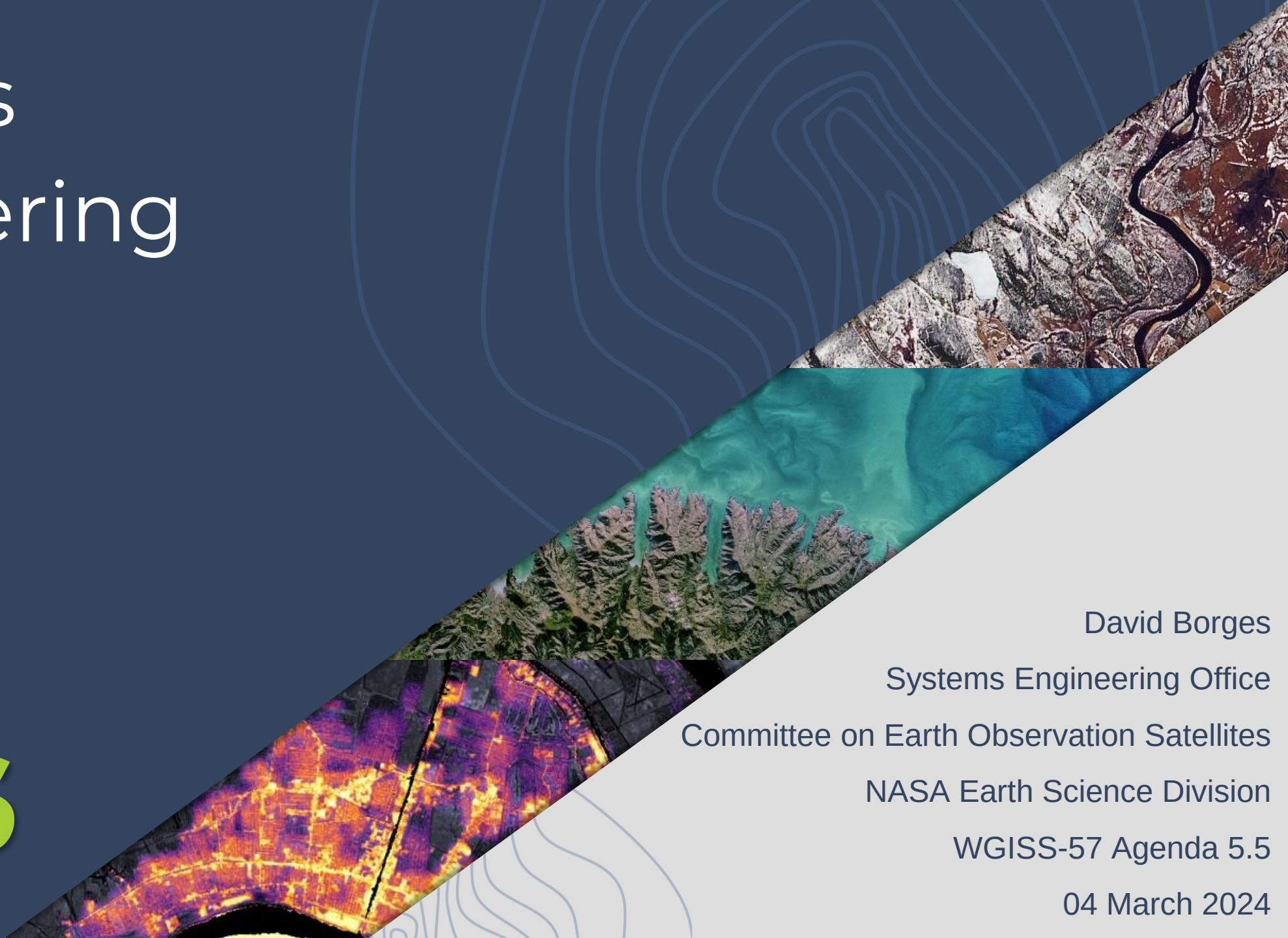
Systems Engineering Office Report



David Borges

Systems Engineering Office

Committee on Earth Observation Satellites

NASA Earth Science Division

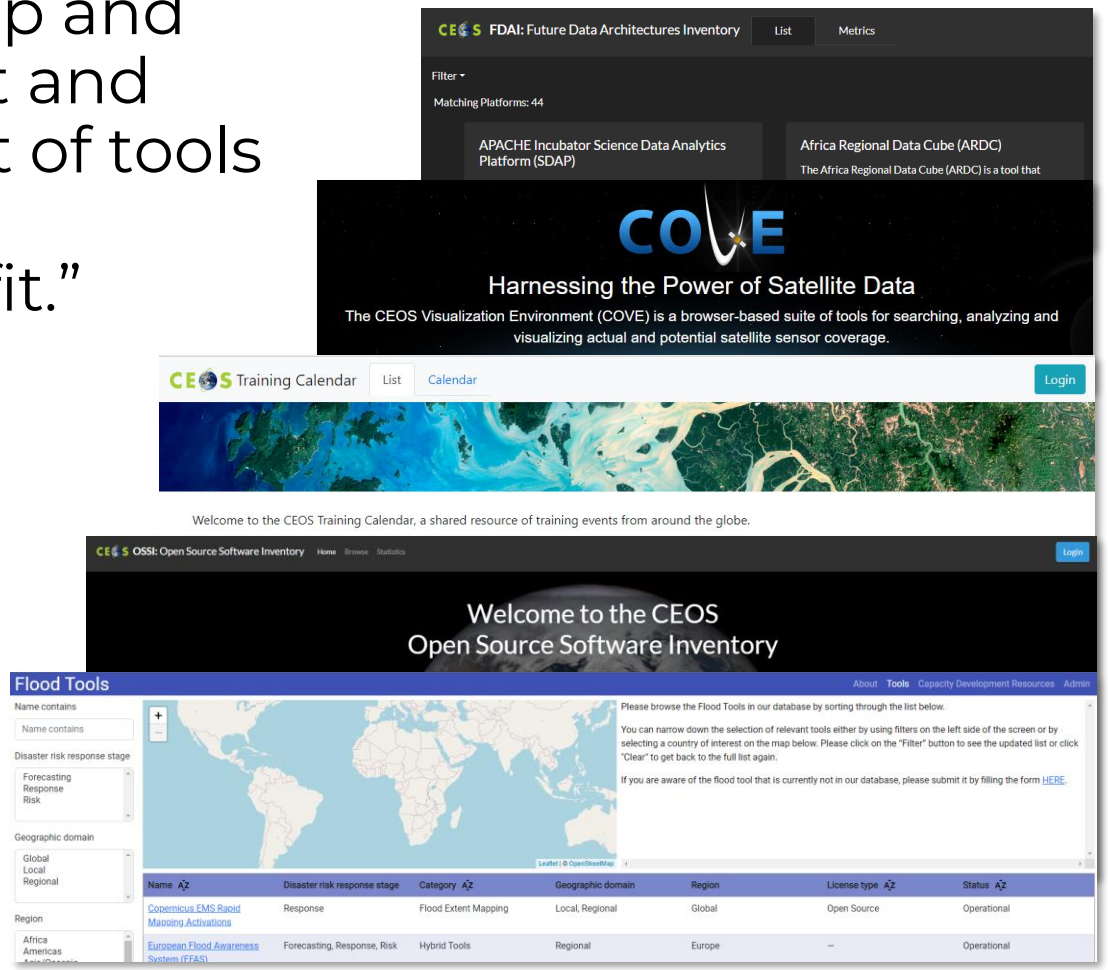
WGISS-57 Agenda 5.5

04 March 2024

CEOS Committee on Earth Observation Satellites

SEO Fundamentals

- "Provide systems engineering leadership and support to CEOS through management and technical services and the development of tools and products that facilitate systems engineering solutions for societal benefit."
  - CEOS website infrastructure
  - Deliverables Tracking Tool 2.0
  - CEOS Visualization Environment (COVE)
  - Open Source Software Inventory
  - Future Data Architectures Inventory
  - Training Calendar
  - EOTEC DevNet
  - Open Data Cube (ODC)
  - CEOS MIM Database Team support
  - Cloud Native Geospatial



CEOS Earth Analytics Interoperability Lab

CEOS Earth Analytics Interoperability Lab

Working Group on Information Systems and Services and Systems Engineering Office

20 April 2020

Robert Woodcock, CSIRO, WGISS Chair
Brian Killough, NASA, SEO Director

Situation

A significant number of CEOS activities are now engaged in the CEOS ARD and FDA strategies and in Integrated Earth observation data analysis (COAST, SDG, WGClimate, LSI-VC, WGDisasters, GEO Aquawatch and GEOGLAM). There is strong collaboration between groups with both WGISS and SEO being sought for technical advice and coordination on issues related to interoperability of all kinds including data standards, formats, analytics and discovery services.

To date coordination has taken the form of project linkages, development of common terminology (e.g. CEOS Interoperability Terminology Report), and joint development and use of best practice approaches (e.g. The LSI-VC CARD4L specification and process is being used as a template for the for CARD4Water). This has worked well for more isolated outputs like data standards.

Current project activities are seeking to improve data discovery and analytics interoperability with often subtle impacts on CEOS services be they provided by WGISS, SEO or CEOS agencies. The CEOS community has reached a point where ARD and FDA activities need to become demonstrable and testable in a live service ecosystem in order to validate interoperability throughout the EO value chain from Discovery through to Analytics outcome.

CEOS Analytics Lab

Analytics Lab Home Page

- Home Page Located at:
  - https://ceos.org/cal/
- Login Button:
  - Main Login for CAL
- Services Tab (Upper Right)
  - JupyterHub
    - Directs to JupyterHub Homepage
  - Explorer
    - Explore Data Available in CAL
  - Support Request
  - Data Request

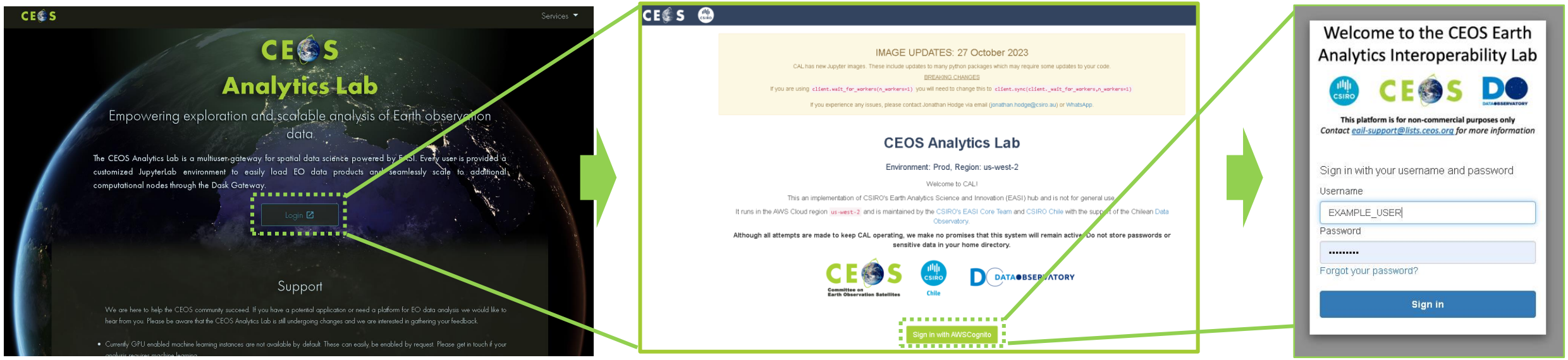
Analytics Lab Architecture

- CAL is an implementation of CSIRO's Earth Analytics Science and Innovation platform (EASI)
- Combination on several open-source projects:
  - JupyterHub
  - Open Data Cube
  - Dask
- 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.

Login

- Once an account has been provisioned, one can log into CAL through the main CAL homepage.

1. Select 'Login' on homepage -> 2. Redirects to environment page: Select 'Sign in with AWS Cognito' -> 3. Enter your Username and Password and 'Sign in'

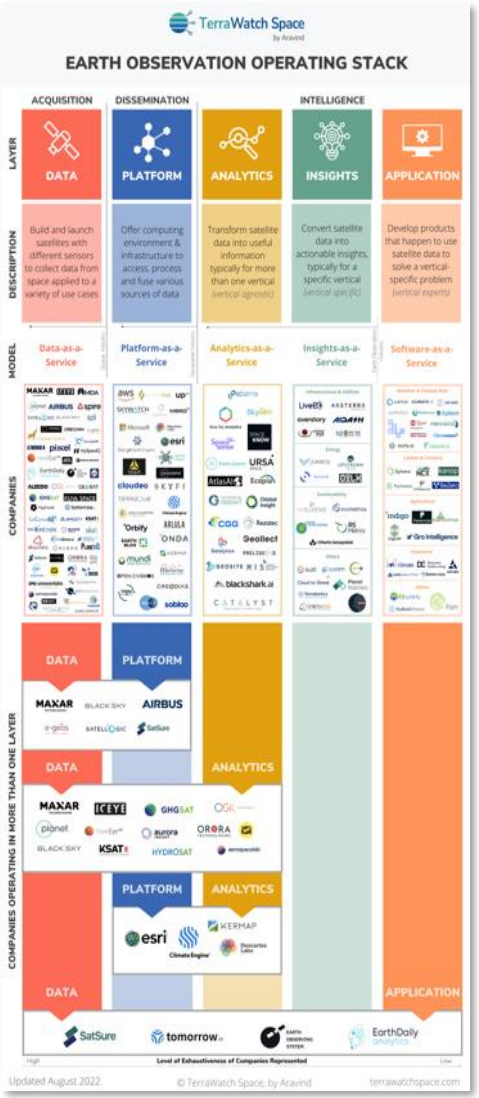


New Space Interoperability Project

- 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



New Space Interoperability Project

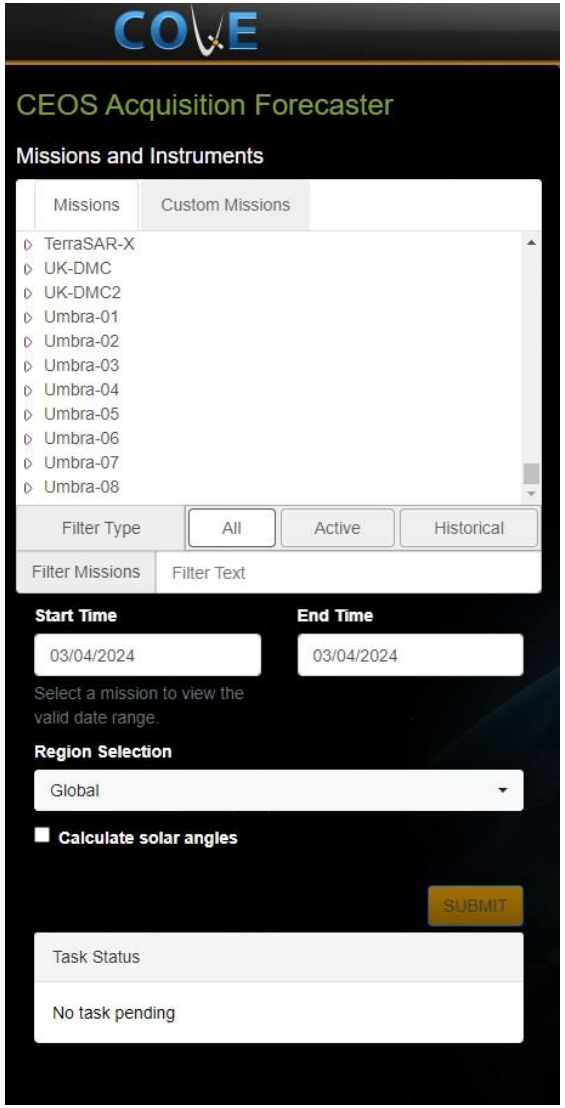
- Key Considerations and Challenges
  - Sensor Variation
    - Impacts spectral band alignment, spatial detail, signal strength
  - Processing Biases
    - Differences in atmospheric correction and vendor-specific sharpening will influence direct comparisons
  - Situational Factors
    - Slight time offsets and viewing geometry differences create irreducible limitations
  - Commercial data compliance with CEOS-ARD PFS

New Space 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)

CEOS Visualization Environment (COVE)

- Tool Suite
  - Acquisition Forecaster
  - Coverage Analyzer
  - Revisits Calculator
  - Coincident Calculator
  - Data Browser
  - Data Policy
  - Country Coverage
  - Utilities



CEOS Outreach

- SatSummit 2024
  - Washington, D.C.
  - 16-17 May

- IGARSS 2024: CEOS Booth
  - Athens Greece
  - 7-12 July

Discussion

- CEOS COVE utilization by WGISS?
- Desired improvements or mission additions?

- How can this work integrate with, or support WGISS Interoperability Framework?

- Are there other WGISS activities that could utilize Analytics Lab?