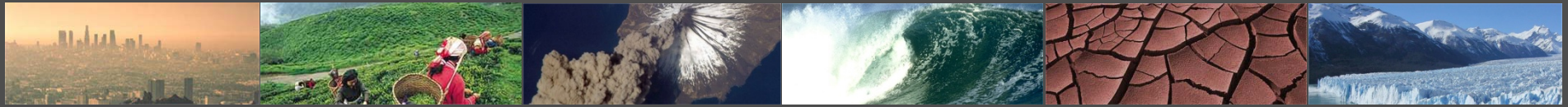
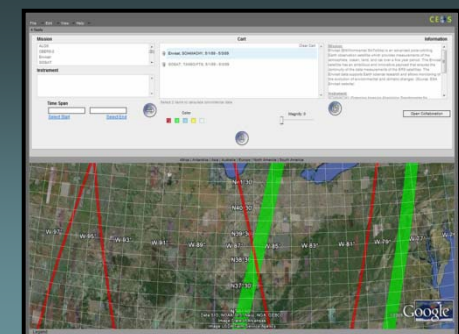
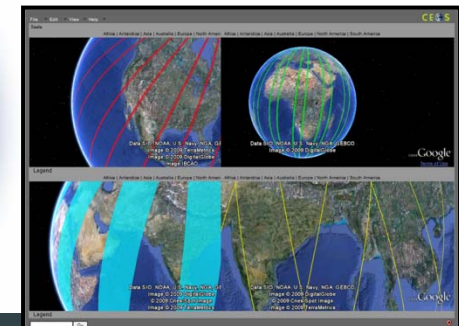
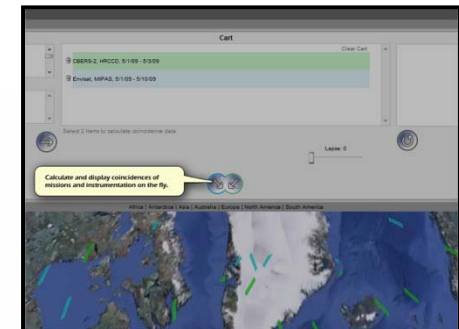
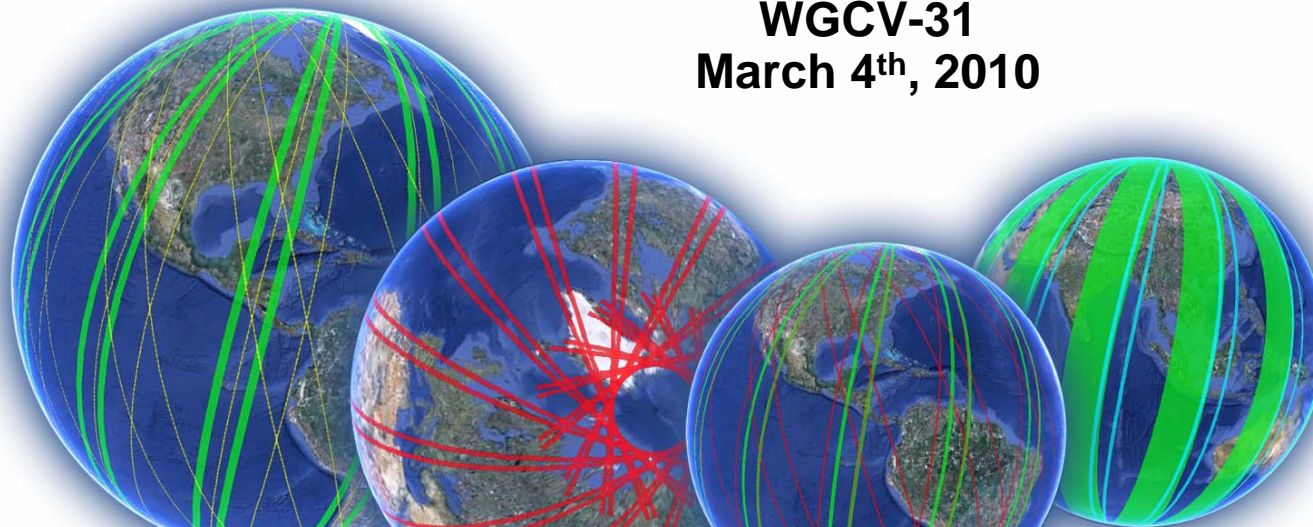


COVE (CEOS Visualization Environment)



WGCV-31
March 4th, 2010



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Outline

- Overview
- Philosophy
- Architecture
- Data
- Capabilities
- Demo
- Future Work

Presented at 2009 AGU Fall Meeting

COVE (CEOS Visualization Environment)

CEOS Committee on Earth Observation Satellites

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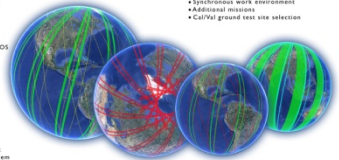
OVERVIEW:

The CEOS Visualization Environment (COVE) tool is a browser-based system that leverages Google Earth to display satellite sensor coverage areas and for the identification of coincident scene locations. The NASA CEOS Systems Engineering Office (SEO) worked with the Committee on Earth Observing Satellites (CEOS) Working Group on Calibration and Validation to develop the COVE tool.

COVE is currently operating and planning hundreds of Earth observation satellites. Standard Calibration and Validation (CALVAL) exercises to compare near-simultaneous surface observations and identify co-occurring image pairs are time-consuming and labor-intensive. COVE is comprised of a suite of tools developed to make such tasks easier.

FEATURES:

Key features and capabilities include user-defined resolution periods (start and end dates) and regions of interest (rectangular areas). COVE allows predefined geographical locations or a point search (specific latitude) capability.



FUTURE WORK:

COVE is developed on a flexible framework that allows it to remain easily extensible. Future work under consideration includes:

- Onboard data validation and workstation testing
- Earth maps
- Synchronous work environment
- Additional missions
- Cal/Val ground test site selection

Notional Architecture

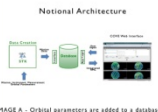


IMAGE A: COVE parameters are added to a database from which the tool retrieves the data and displays the results to the user.

IMAGE B: The COVE User Interface is divided into 4 sections: SEARCH, CART, INFORMATION, and Google Earth Viewport.

IMAGE C: Multiple scenarios in different display views (2D and 3D) of the user interface are applied to a single viewpoint for easy navigation.

IMAGE D: Multiple selected data represent satellite image coverage. Users can overlap scenes to view coincident coverage.

MISSIONS & INSTRUMENTS

COVE currently includes the following missions and instruments:

| | |
|---|--|
| Mission: ALOS Instrument: AVIRIS-2 | Mission: Landsat-7 Instrument: ETM+ |
| Mission: CBERS-2 Instrument: HRCC/Changrui-2 | Mission: SPOT-5 Instrument: HRG |
| Mission: Earthstar Instrument: SCIAMACHY | Mission: TERRA Instrument: MODIS |
| Mission: GOSAT Instrument: TANSO-FTS | Mission: THEOS Instrument: HS |
| Mission: IRS-P3 Instrument: LIS-II | |
| AWIPS | |

and more to come!

IMAGE E: Areas of interest can be specified in a COVE scene or as a "Point" where the tool will search for coincident coverage. The user can also specify the search area.

IMAGE F: Coincident observations for multiple missions can be compared side-by-side for mission and data sets. The Earth can be rotated in 3D, and the results can be exported to Excel or Web browser.



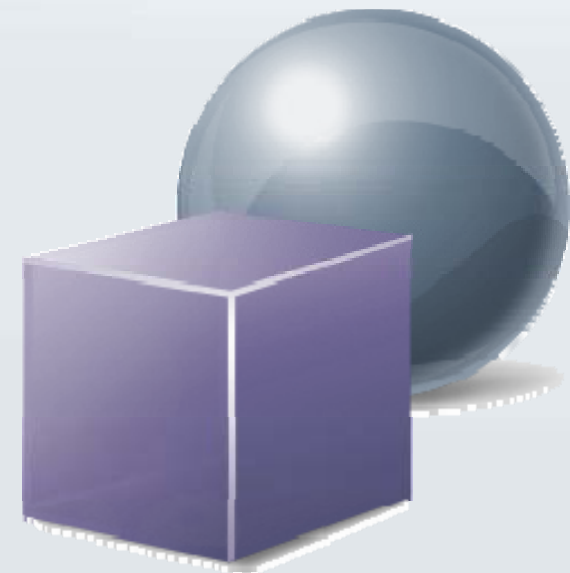
Overview

- **COVE was Funded by Dr. Brian Killough (CEOS SEO)**
 - COVE has been developed for a little over a year
- **COVE - CEOS Visualization Environment**
 - Visualization (data management, analysis) tool developed by AMA, Inc.
 - Maps CEOS Mission, Instrument data on Google Earth Web
 - Web 2.0 Interface integrated with a mission database
 - Runs in your browser, thin client, platform independent
- **Objectives:**
 - (Easy) Accessibility: Accessible to the international community
 - Openness: Ability for others to add their data
 - Extensibility: IT Framework extensibility
 - Improve communication: Cal/Val, CEOS community
 - Collaboration: Tool was developed with collaboration in mind



The Power of Simplicity

- **The Power of Simplicity**
 - Only a Web browser is needed.
 - No need to learn data formats and programming.
 - No need to download large amounts of data.
 - Customized data and analysis can be obtained with only a few mouse clicks.
- **Guiding philosophy:**
 - Web 2.0 vs. GIS (integrate, store, analyze, share, display)
 - Lightweight: E.g., Session/User management, performance
 - Flexible: E.g., Data Integration (ftp, http, KMZ, KML, DB, etc.)
- **We have built a web-based GIS tool with a database backend.**
 - This tool can be easily adopted to other applications
 - A number of NASA missions have shown interest
- **Discriminators: How is our application value-added?**
 - Generalized Framework
 - Mission Database
 - Multiple Viewports
 - Collaboration
 - Session Management
 - Analysis Plug-in Architecture: Coincident module
 - Export capability





Notional Architecture

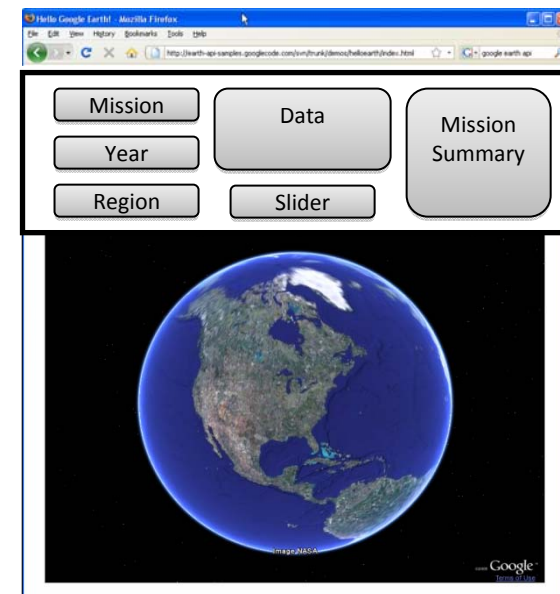
Data Creation



Mission, Instrument, Measurement
Orbital Parameters



Google Earth Web





COVE Mission Database

Mission

Instruments

| | | |
|-----|------------|-------------------------|
| 1. | ALOS | AVNIR-2 |
| 2. | CBERS-2 | HRCCD |
| 3. | Envisat | SCIAMACHY, MIPAS, MERIS |
| 4. | GOSAT | TANSO-FTS |
| 5. | IRS-P6 | LISS-II, AWIFS |
| 6. | Landsat-7 | ETM+ |
| 7. | Sentinel-2 | Multispectral Imager |
| 8. | SPOT-5 | HRG |
| 9. | TERRA | MODIS |
| 10. | THEOS | MS |

What's next?

- Focus on upcoming Cal/Val campaigns
- Driven by other CEOS stakeholders
- More general requests

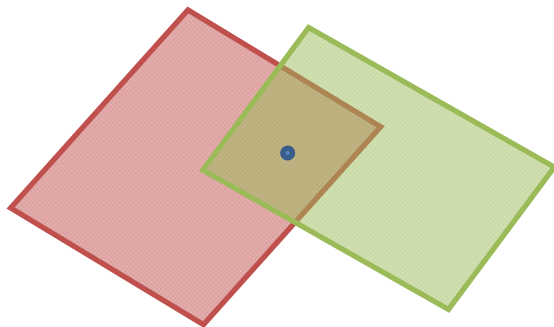
** Get your data into COVE*



COINCIDENT USE CASE 1: POINT-BASED

- Input:
 1. User enters a site location (lat, long)
 2. User selects missions of interest (2 or more)
 3. User specifies lapse time and overall search period
- Output:
 1. Show footprints of missions acquired over the site that are within the lapse time limit
 2. Output list of coincidence pairs in tabular format

Satellite 1



Satellite 2

** Sample Data*

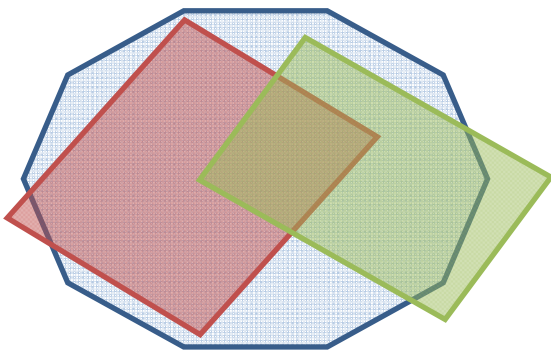
| Coincidence | Mission A | Time | WRS (p/r) | Mission B | Time | WRS (p/r) | Lapse Time (sec) |
|-------------|-----------|------------------|--------------|-----------|---------------|--------------|---------------------|
| 1 | Landsat-7 | 1/5/09 12:30 | 20/30 | IRS-P6 | 1/5/09 12:31 | 30/40 | 60 |
| 2 | Landsat-7 | 1/8/09 14:30 | 20/30 | Envisat | 1/8/09 14:35 | 50/20 | 300 |
| 3 | Envisat | 1/12/09 17:20 | 50/20 | IRS-P6 | 1/12/09 17:22 | 30/40 | 120 |



COINCIDENT USE CASE 2: REGION BASED

- Input:
 - User enter a region as a polygon
 - User select missions of interest (2 or more)
- Output:
 - User specify lapse time and overall search period
 - Show footprints of missions acquired in the region that are within the desired lapse time limit
 - Output list of coincidence pairs in tabular format

Satellite 1



Satellite 2

** Sample Data*

| Coincidence | Mission A | Time | WRS (p/r) | Mission B | Time | WRS (p/r) | Lapse Time (sec) |
|-------------|-----------|------------------|--------------|-----------|---------------|--------------|---------------------|
| 1 | Landsat-7 | 1/5/09 12:30 | 20/30 | IRS-P6 | 1/5/09 12:31 | 30/40 | 60 |
| 2 | Landsat-7 | 1/8/09 14:30 | 20/30 | Envisat | 1/8/09 14:35 | 50/20 | 300 |
| 3 | Envisat | 1/12/09 17:20 | 50/20 | IRS-P6 | 1/12/09 17:22 | 30/40 | 120 |

...Use Case 3: Global Coincident Calculation - COMPLETED



Collaboration

- Asynchronous:
 - Session Files
 - Bookmark files
- Synchronous
 - Synched viewing
 - Fully synched collaboration
- Real-time Chat
 - Language barriers
 - Sharing information





COVE Login Screen

COVEv1.1 Login

http://saif-1.larc.nasa.gov/covev1.1/login.aspx#

CEOS Committee on Earth Observation Satellites

CEOS Visualization Environment (COVE)

COVE Login

User Name:

Password:

Overview

COVE Overview

CalVal

CalVal



COVE

Search using
Dynamic Menus

Cart

Context-specific
Information

The screenshot displays the COVE web application interface. At the top, there is a menu bar with 'File', 'View', 'Collaboration', and 'Help'. Below this is a 'Tools' section. The 'Mission' panel on the left lists various satellite missions: ALOS, CBERS-2B, Envisat, GOSAT, IRS-P6, Landsat-7, Sentinel-2, SPOT-5, TERRA, and THEOS. A magnifying glass icon is next to the list. The 'Instrument' panel shows 'TANSO-FTS'. The 'Time Span' panel has 'Start Date' and 'End Date' fields. An orange arrow points from the 'Add to Cart' button to the 'Cart' panel. The 'Cart' panel shows a list of items: 'SPOT-5, HRG, 5/1/09 - 5/3/09', 'CBERS-2B, HRG, 5/1/09 - 5/3/09', and 'IRS-P6, L1, 5/1/09 - 5/3/09'. A red shopping cart icon is in the center. An orange arrow points from the 'Cart' panel to the 'Information' panel. The 'Information' panel shows a blue information icon and a small image of a satellite. Below the 'Tools' section are three large panels: 'SEARCH', 'CART', and 'INFORMATION'. An orange arrow points from the 'CART' panel to the 'VIEW' panel. The 'VIEW' panel shows a globe with satellite orbits. A blue globe icon is in the center. The 'VIEW' panel also shows a 'Legend' section at the bottom left and a 'Go' button at the bottom right. The 'VIEW' panel is labeled 'VIEW' at the bottom. A blue arrow points from the 'VIEW' panel to the 'Viewpoint' label at the bottom right.

SEARCH

CART

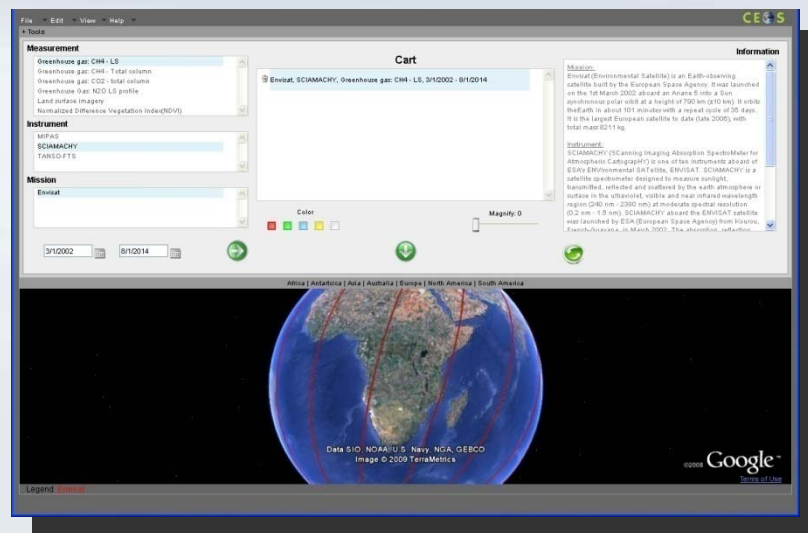
INFORMATION

VIEW

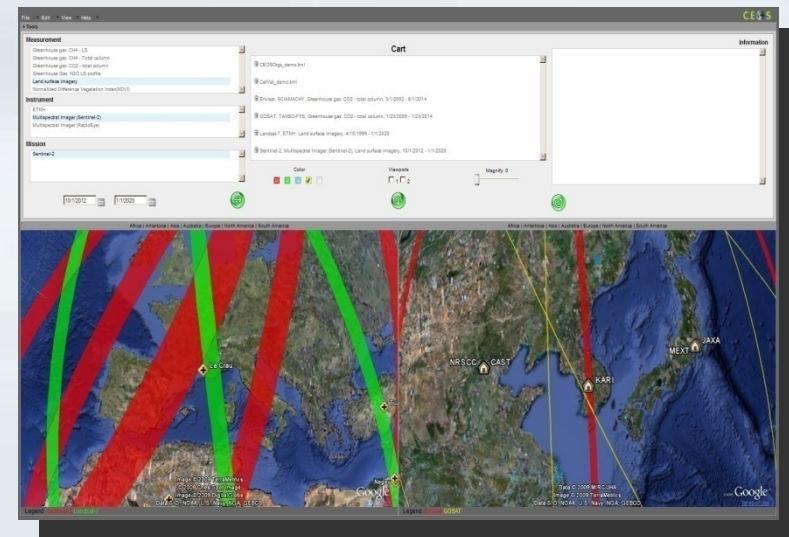
Viewpoint



Training Videos on YouTube



Application Overview



Use Case (Multiple Viewports)



Future Work

- Tool Validation and Verification – We need your help here!
- From prototype to production:
 - Scalability
 - Robustness
- Collaboration Implementation
- Google Maps integration
- Even easier data integration and management
- Tool Resurfacing – User Interface
- Expand Mission database

