Open Data Cube Background and Vision

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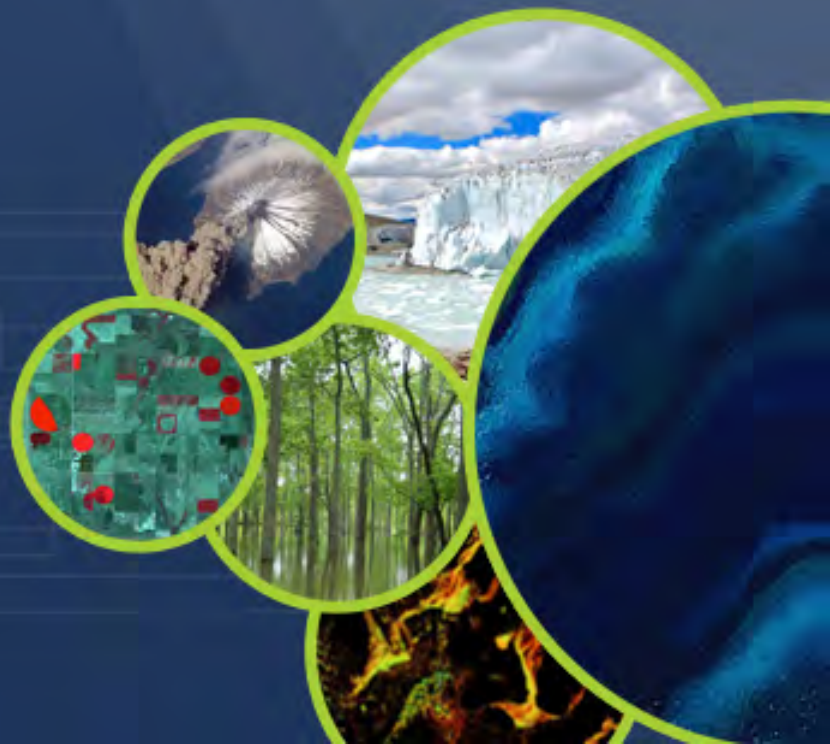


What is CEOS?

www.ceos.org

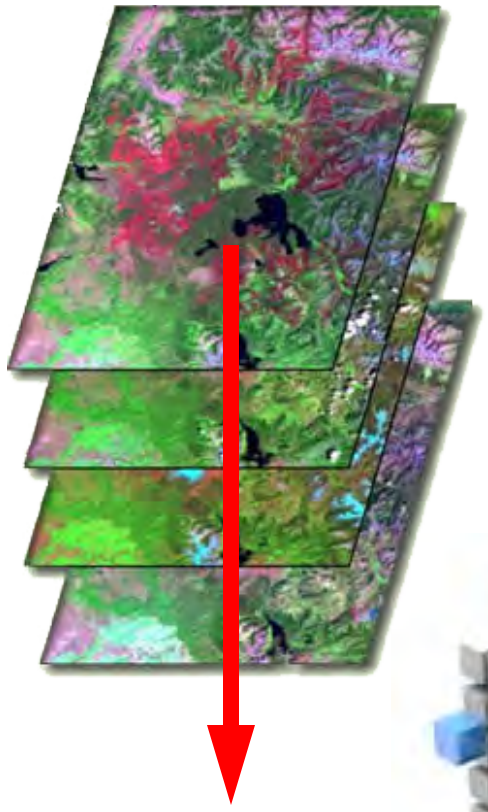
The Committee on Earth Observation Satellites (CEOS) serves as a focal point for international coordination and data exchange to optimize societal benefit from space-based Earth observations. CEOS represents 22 countries through its 32 space agencies and 28 associate members. CEOS is operating 145 satellites as of Dec 2016.

The Open Data Cube initiative was started by CEOS in 2016

Group photo from the 2016 CEOS Plenary in Brisbane, Australia

What are Data Cubes?

- **Data Cube** = Time-series multi-dimensional (space, time, data type) stack of spatially aligned pixels ready for analysis
- **Proven concept** by Geoscience Australia (GA) and the Australian Space Agency (CSIRO) and planned for the future USGS Landsat archive.
- **Analysis Ready Data (ARD) ...** Dependent on processed products to reduce processing burden on users
- **Open source** software approach allows free access, promotes expanded capabilities, and increases data usage.
- **Unique features:** exploits time series, increases data interoperability, and supports many new applications.



Why Data Cubes?

The primary user problems are data access, data preparation, and efficient analyses

- Users want to minimize the time and knowledge required to obtain and prepare satellite data
- Users want free and open source solutions.
- Users want to perform time series analyses
- Users want to use multiple datasets together
- Users want to use common GIS tools
- Users want to “own” the data and keep it locally
- Users want customer service and support

- Our goal is **NOT** to sell a product or give out a tool …
- Our goal is to provide a **SOLUTION** that has **VALUE** and increases the **IMPACT** of satellite data.

CEOS Data Cube Vision

A solution supporting CEOS objectives …

- Build capability of users to apply CEOS satellite data
- Supporting priority CEOS/GEO agendas and SDGs

CEOS Agencies wanting to participate …

- Through provision of CEOS Analysis Ready Data (ARD) products
- Contributing to development and uptake of solutions

Customers feel that they are the focus …

- Training materials and easy installation/maintenance
- An "Open Data Cube" brand that people know and trust
- An active Open Data Cube community of users

Scalable solution …

- Operational Data Cubes in **20 countries by 2022**
- Key partners (e.g. GEO, World Bank) supporting data cube projects

www.opendatacube.org

What are the challenges?

Acceptance … Will EO satellite data providers and key global stakeholders agree that the ODC vision is achievable and worth their contribution?

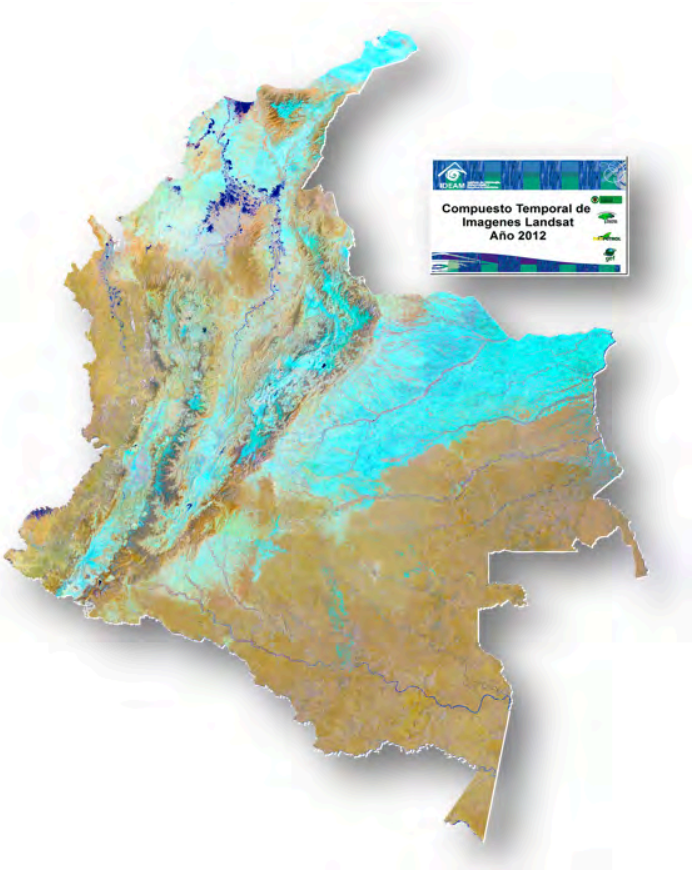
- CEOS has utilised prototype efforts to demonstrate the functionality and impact of the ODC and has reached out to global stakeholders (e.g. GEO, World Bank, SERVIR, AWS) to explore common objectives.
- Global interest in the ODC initiative has been promising and CEOS is making progress toward “acceptance” of the ODC as a trusted solution with user value.

Scaleability … How does this solution scale to meet the demand of many global users given limited resources?

- There are 3 national data cubes (e.g. Australia, Colombia, Switzerland) but many more countries with interest. In order to get 20 countries, it will take more than CEOS, and require help from other stakeholders (e.g. World Bank, SERVIR, GEO) and support from existing data cube countries.

Colombia Prototype

- The Government (IDEAM) and University (Andes) have made considerable progress in learning how to create and use Data Cubes! The CEOS SEO will continue to support Colombia into 2017.
- A complete country-level Landsat Data Cube (25,000 scenes back to year 2000) was completed in Dec 2016. Forest mapping and land change detection are the primary applications.



- Currently working on reingesting the new Landsat "Collections" data and learning how to use the new CFMASK cloud mask.
- Working with CEOS to develop a machine learning approach for cloud filtering to improve annual mosaics.
- Strong desire to add Sentinel-1 and 2 to their cube.

Switzerland Prototype

- CEOS was approached by UNEP GRID Geneva and the Univ. of Geneva to develop a Data Cube pilot. Significant computing and programming resources exist, so little effort was needed to get them started.
- The Swiss team has completed ingestion of ~4000 Landsat scenes from 1984-2017 in the Swiss Data Cube (SDC). They have set up automatic updates for new Landsat-8 scenes, as they are available. A new website will launch in August 2017: **http://www.swissdatacube.org**
- The Swiss government has renewed it support through the end of 2017 and they are working with two key institutions in Switzerland on Sentinel 1 and Sentinel 2 data. In addition, they have two summer students working on the SDC with a focus on data analysis.



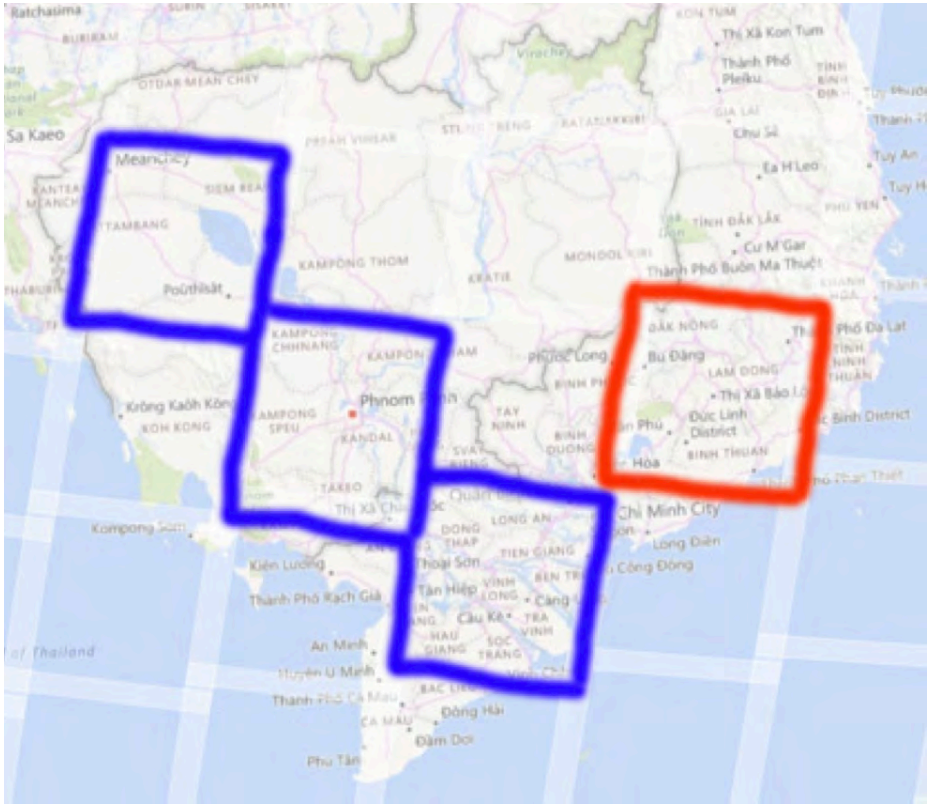





Vietnam Prototype

- CEOS SEO and CSIRO are supporting deployment of the Vietnam Data Cube. The primary applications are rice crops, forest management and water quality.
- Two sample data cubes are under development by CEOS. Landsat, Sentinel-1 and ALOS data.

- **BLUE:** Mekong Basin cube for Cambodia and Vietnam for SERVIR testing.
- **RED:** Vietnam cube to support initial deployment training and test GFOI forest applications.
- VNSC intends to develop a master plan in 2018 to expand the use of the Data Cube to serve Vietnam.
- VNSC has signed an MOU with FIPI to use the Data Cube to support forest monitoring. Rice monitoring will be coordinated through AsiaRice. Water quality is a less mature discipline but VNSC is learning through workshops.
- Vietnam Universities are planning to use the Data Cube as a training and research tool to grow local capacity.



The “Road to 20” National-scale Data Cubes by 2020

3 operational, 4 under development, 21 under review