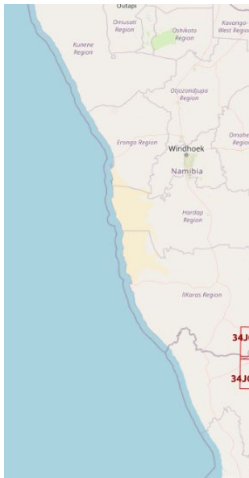




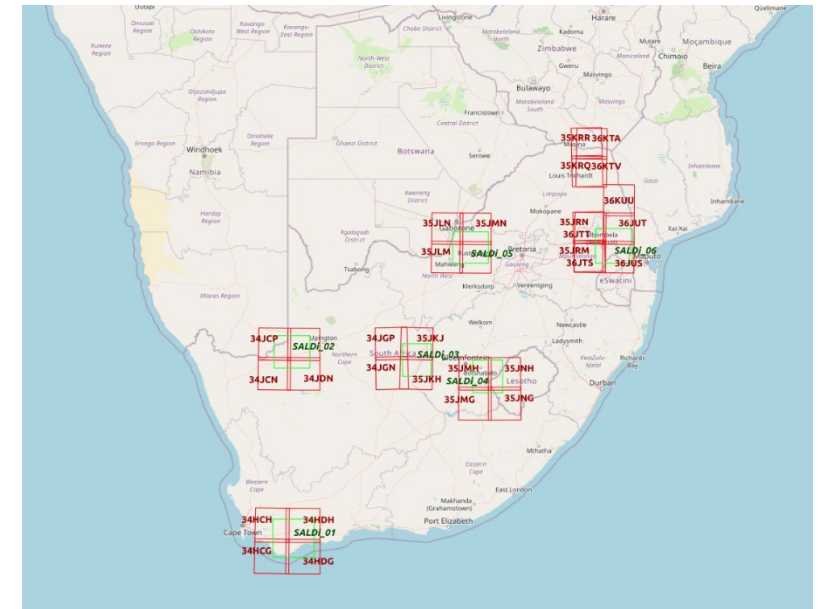
Development of earth observation data cubes for monitoring land degradation processes in South Africa

Insa Otte, Nosiseko Mashiyi, Pawel Kluter, Steven Hill, Andreas Hirner, Jonas Eberle, Marcel Urban, Andiswa Mlisa, Mahlatse Kganyago, Maximilian Schwinger, Ursula Gessner, Christiane Schmullius, Jussi Baade

- uncomplicated EO data access for method development (analysis ready data)
- flexibility and standardization in EO data management
- dynamic working EO tools for research teams and users
- decision-ready EO products
- highly spatio-temporal resolved time-series

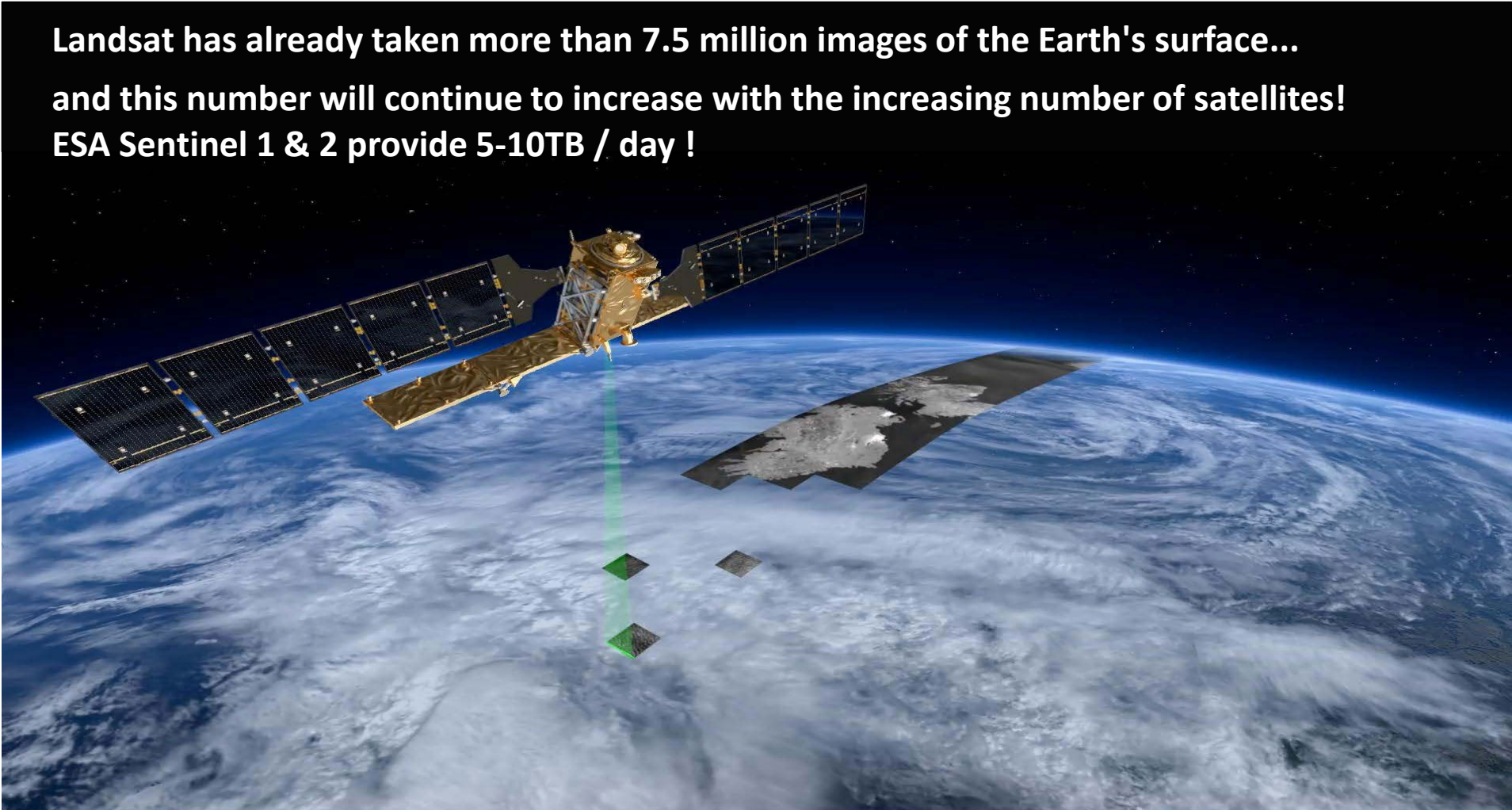
A map of Kenya showing its various regions: Garissa, Mandera, Wajir, Tana River, Lamu, Pwani, Kilimanjaro, Machakos, Meru, Tharaka-Nithi, Embu, Kirinywa, Murang'a, Kiambu, Nyeri, Laikipia, Nandi, Baringo, Elgeyo-Marakwet, Uasin Gishu, Nakuru, Kericho, Bomet, Siaya, Kisumu, Homa Bay, Kwana, and Narok. Major cities like Nairobi, Mombasa, and Kisumu are marked. The Indian Ocean is visible to the east.

for 6 SALDi research sides from 2016 to 2021.

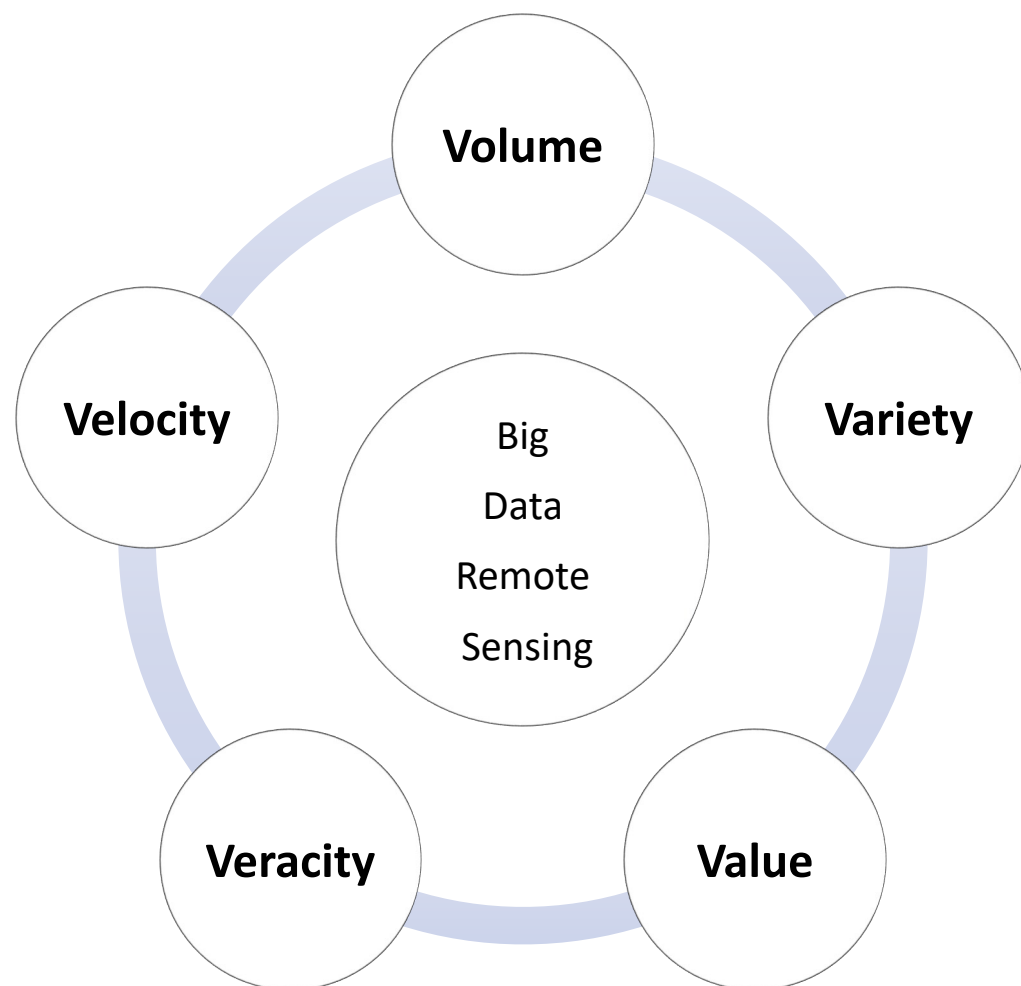


Big Data:

**Landsat has already taken more than 7.5 million images of the Earth's surface...
and this number will continue to increase with the increasing number of satellites!
ESA Sentinel 1 & 2 provide 5-10TB / day !**



Big Data Challenges



Big Data Challenges:

- Collect
- Manage
- Store
- Archive
- Analysis
- Visualize
- Distribute

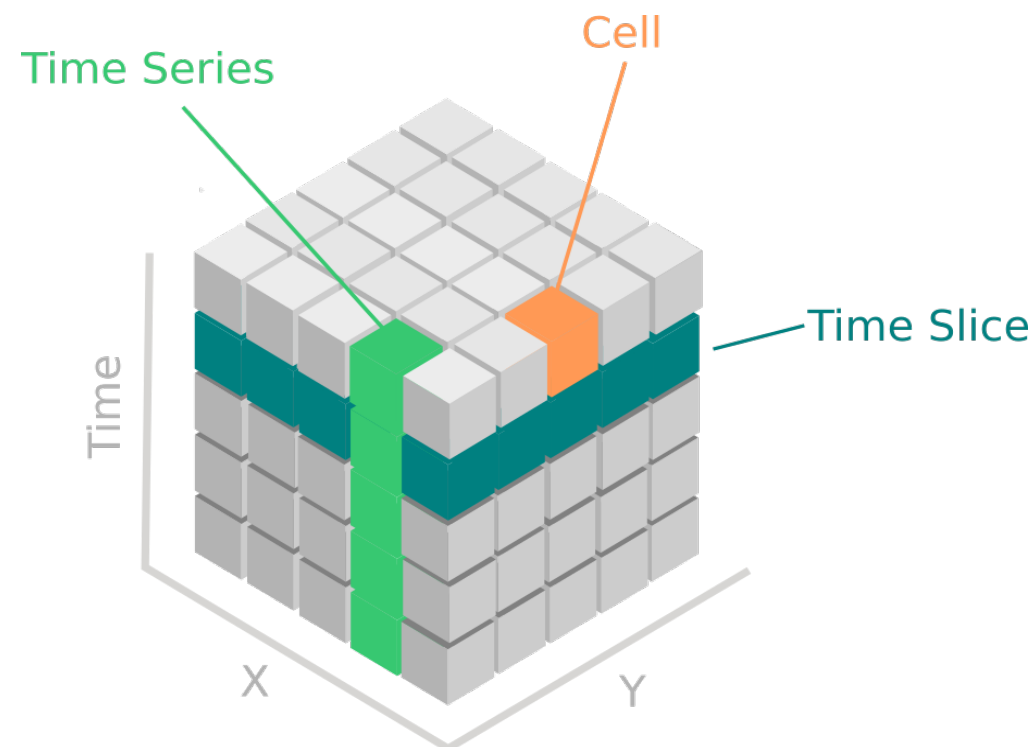
→ Are data cubes the new solution?



What is a data cube ?

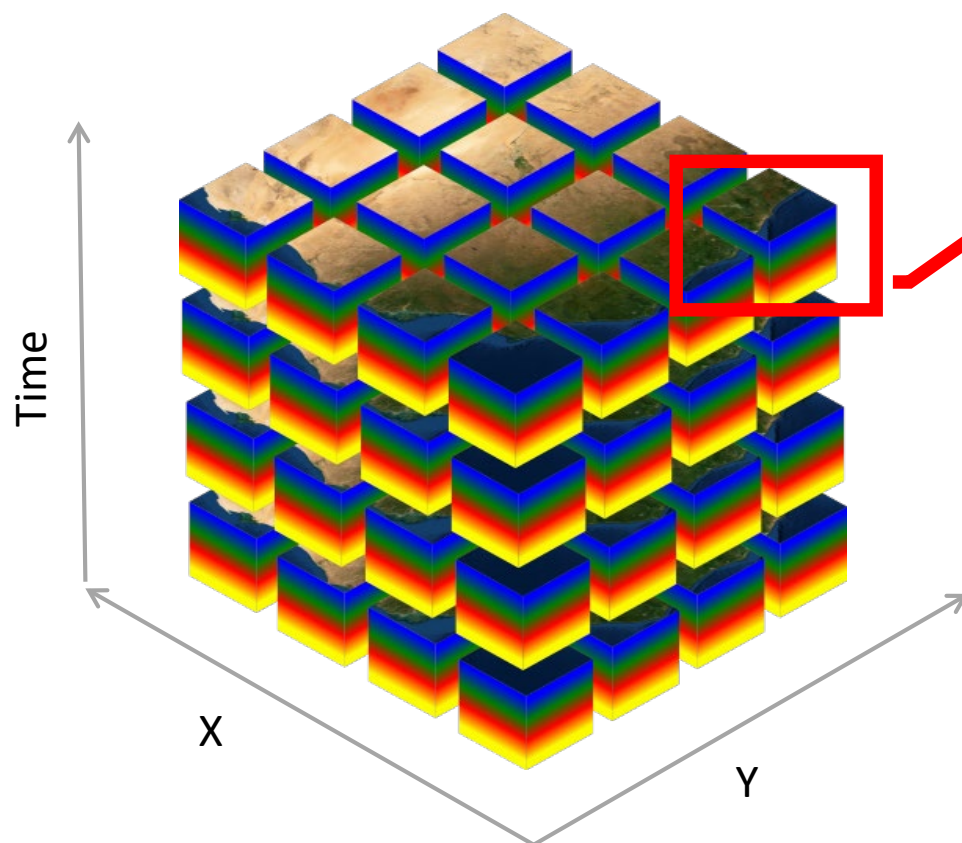
- Used to represent data along some measure of interest
- Can be 2-dimensional, 3-dimensional, or higher-dimensional
- Each dimension represents some attribute in the database
- Each cell in the data cube represents the measure of interest

→ Innovative data analysis infrastructure for the analysis of earth observation data in order to support decision making



Earth observation data cubes

Multi-dimensional stack (space, time, data type) of spatially aligned pixels & used for efficient access and analysis



Sentinel-2 (NetCDF)

Spatial: 10 km x 10 km

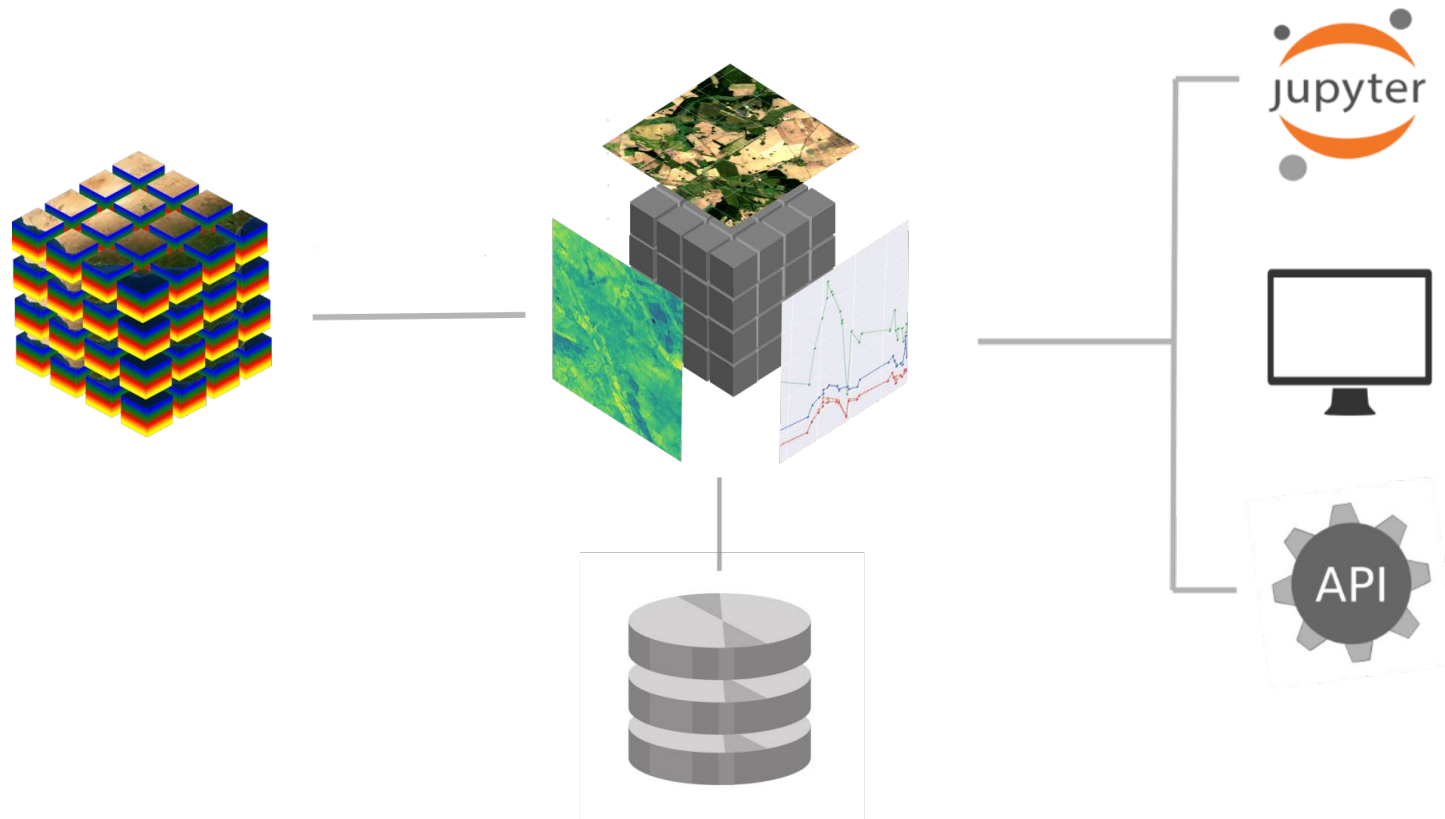
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Bands: 12

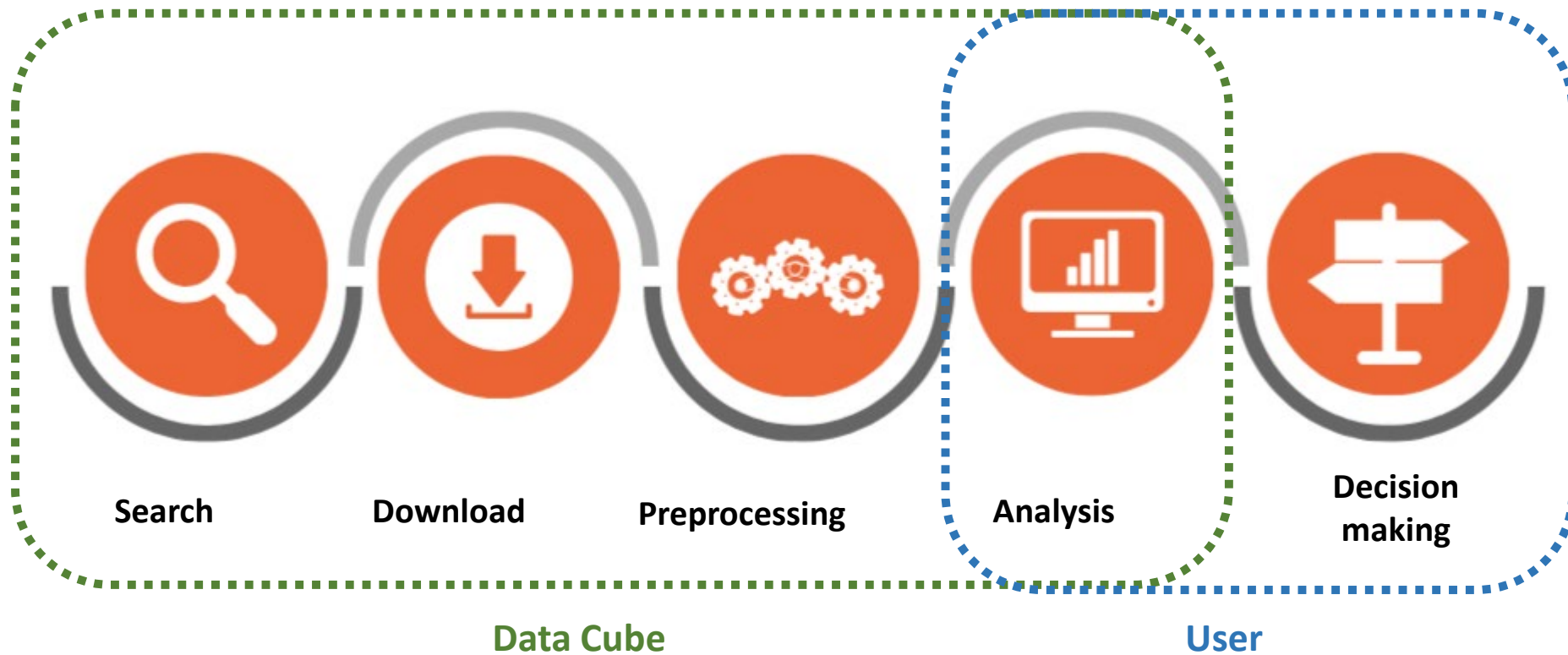


The idea of the SALDi Data Cube is ...

to increase the value and impact of global Earth observation satellite data for South Africa by providing an accessible exploitation architecture for an **efficient and user-oriented analysis based** on multi-temporal earth observation data.



SALDi Data Cube Workflow



What will be inside SALDi Data Cube?

Remote Sensing Products [2016-2021]

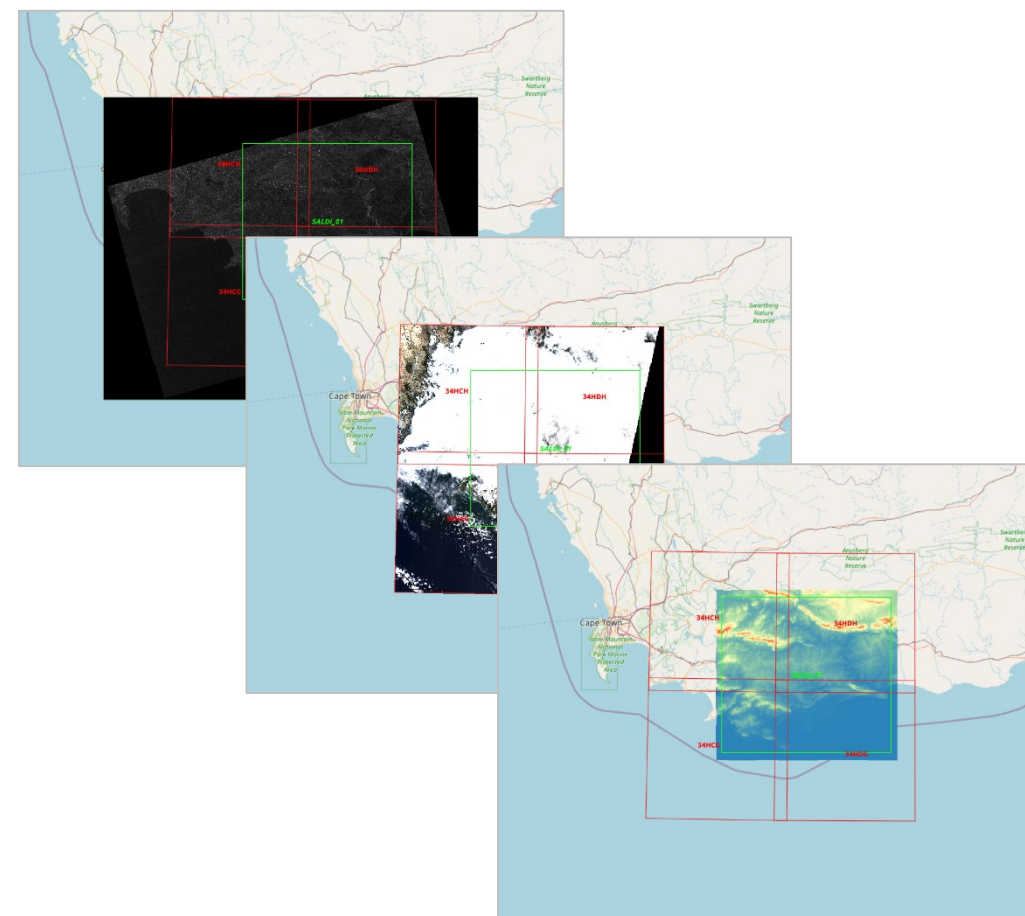
- Sentinel-1
- Sentinel-2
- DEM (Copernicus DEM GLO-30)
- NLC land cover product with 72 classes
- Options: watersheds | soil moisture | ...

Preprocessing

- Sentinel-1: SNAP
- Sentinel-2: sen2cor
- Cloud mask: Fmask

Analysis

- Various spectral indices:
NDVI, RVI, EVI, PVI, DVI, REIP, SAVI, MASVI, TSAVI, NDBI, NDWI, ...



Outlook

- Integration of additional datasets (e.g., watersheds, soil moisture data)
- Calculation of spectral indices/functions
- Implementation of the SALDiCube on the SASSCAL Server
- Preparation of training materials and courses



Thank you for your attention!

