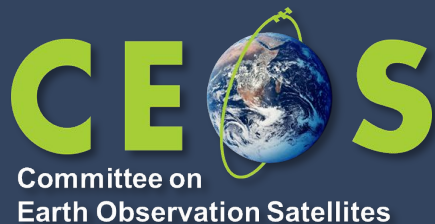
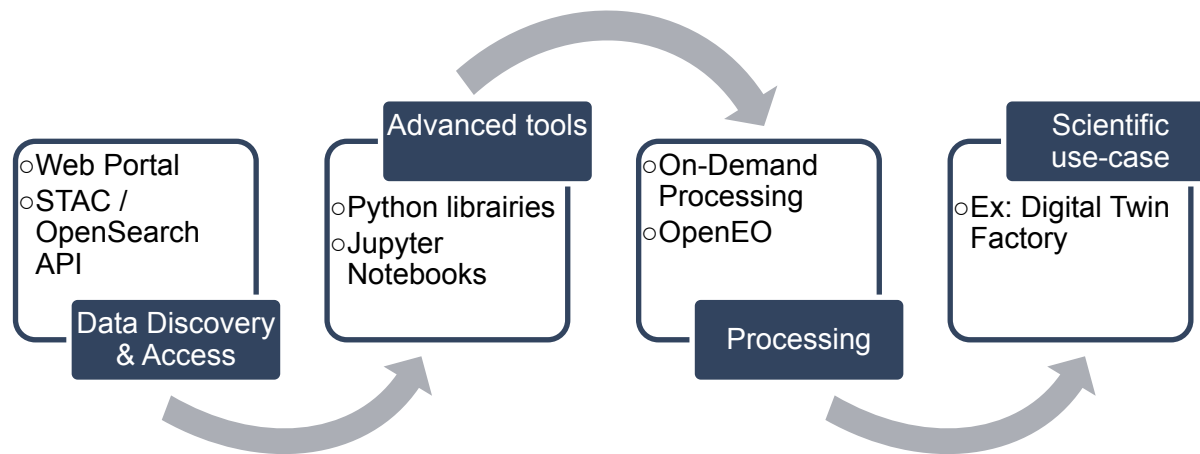


WGISS / WGCV Joint Meeting Agency Reports



Hugo Fournier, CNES
Agenda Item B.6
WGISS / WGCV Joint Meeting
15 & 18 October 2024
Sioux Falls, South Dakota, USA

The journey of an EO data user at CNES



GEODES : A **DATA HUB & SERVICES PLATFORM**



- ❖ **EO Data:** CNES missions and Copernicus program (STAC & OpenSearch API)
 - Current Collections: Sentinel-1 & Sentinel-2
 - Upcoming Collections: SPOT, PWH, SWOT, CO3D, MicroCarb, Trishna, Flatsim, TapisRef
- ❖ **On-Demand Processing** (OGC API Processes)
 - Ortho-rectification, band extraction and many more to come
- ❖ **Datalabs** : Enabling advanced data exploration and analysis with Jupyter Notebook



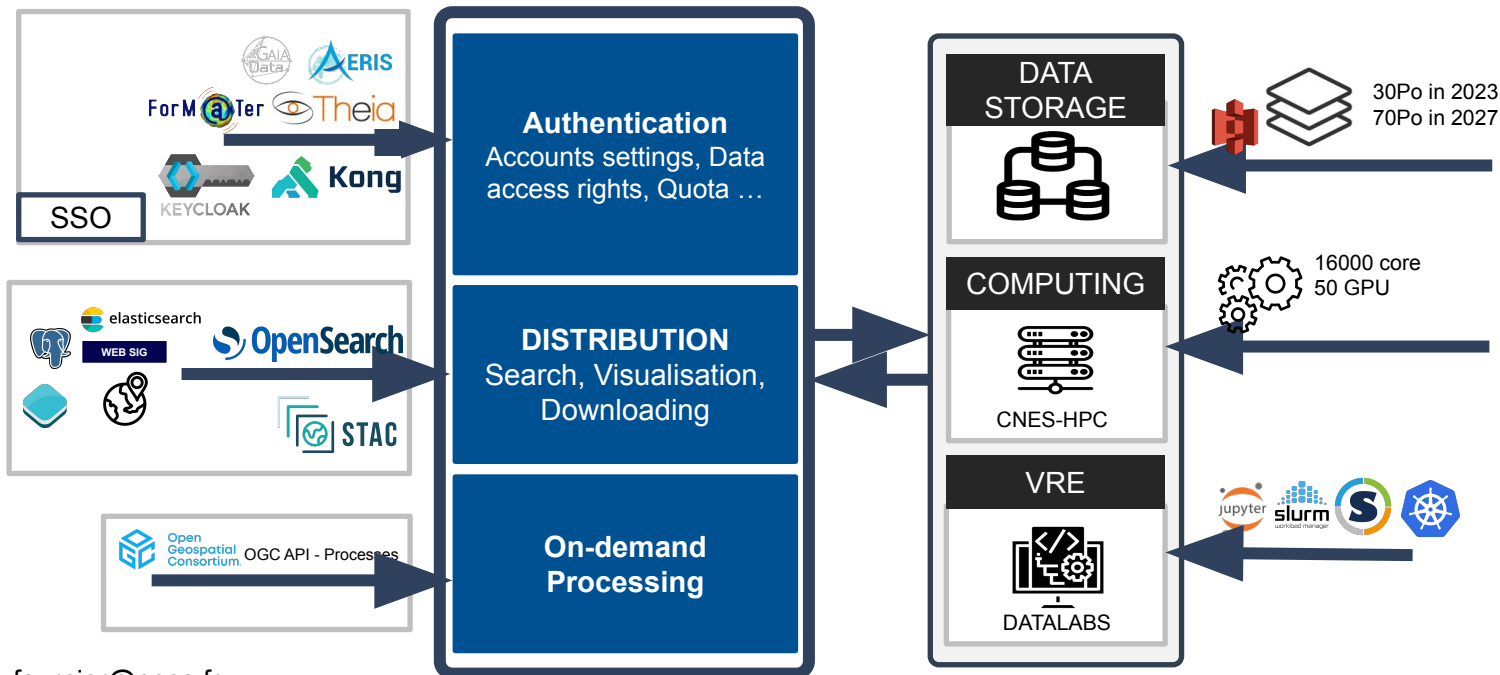
geodes.cnes.fr



Point of contact : olivier.melet@cnes.fr

GEODES : Technical resources and interfaces

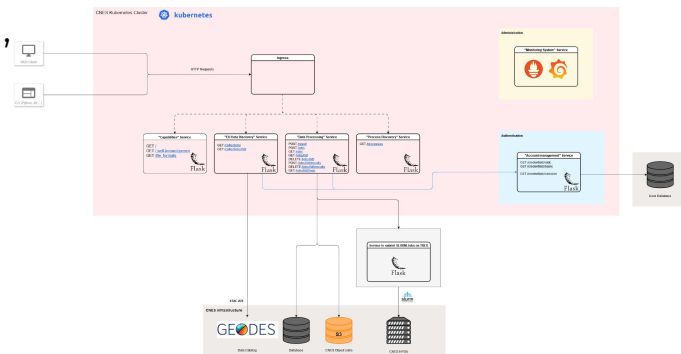
GEODES



Point of contact : hugo.fournier@cnes.fr

GEODES : Focus on other key features

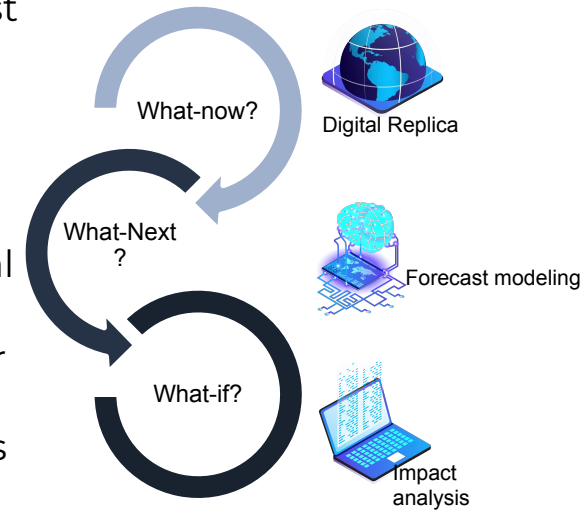
- ❖ **Datalabs** (Work in Progress) : *“Battery Included”* solution :
 - Pre-configured development environment with essential libraries and packages
 - Access to CNES HPDA infrastructure
- ❖ **Data Format**
 - Converting EO products to cloud-optimized formats: COGs and ZARR,
 - Subsetting capabilities to retrieve only relevant data portions
 - Still deciding on systematic conversion or on-demand,
- ❖ **OpenEO Integration:** (Work in Progress)
 - Developing an OpenEO backend
 - GEODES as a OpenEO data provider.



Point of contact : guillaume.eynard-bontemps@cnes.fr

The 3 pillars of a Digital Twin:

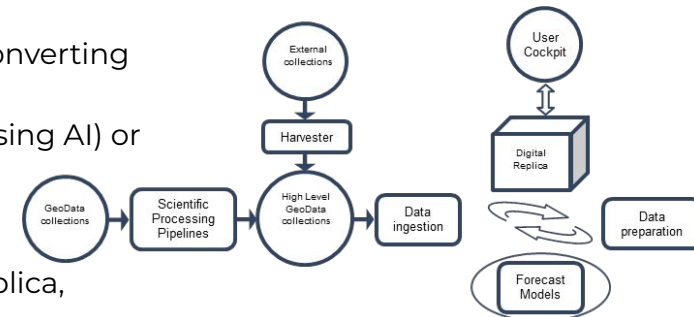
- ❖ **Digital Replica**: virtual representation of a system of interest (e.g., a coastal area, a peri-urban zone, or a forested area)
 - ❖ **Forecast modeling** : predict the future evolution
 - ❖ **Impact analysis** : introduce new hypotheses into the digital replica, predict how the system will evolve using simulation models, and analyze the impacts of these new hypotheses over time.
- This capability to define scenarios and analyze their evolution is what sets a *Digital Twin* apart from a standard data processing framework.



The DTF initiative :

Develop a set of highly specialized local digital twins with high precision (on the scale of meters), in contrast to *global digital twins* that operate at a coarser resolution (on the scale of kilometers).

1. Ingestion phase : harvests geospatial and external data to integrate them into the digital replica.
 - typically involves aligning multimodal data, resampling them, converting them into an ARD format, and quantifying uncertainties.
 - Extended metadata can also be extracted from the data itself (using AI) or from external databases to build a thematic knowledge base.
2. Visualization : by the user through the Cockpit interface.
3. Prediction model: The predicted data is reintegrated into the digital replica, allowing for comparative analysis in the Cockpit.
4. Modify parameters or inject new hypotheses, rerun the predictive model, and analyze the outputs. This iterative process continues until a solution to the initial problem is found.



- ❖ Currently / Starting to get involved in some National & International working groups (ESA DCB, OGC, Pangeo)
- ❖ Platform Federation : WEkEO, ESA, DataTerra
- ❖ Digital Twin federation : NASA/AIST, ESA to come, National initiatives, SCO
- ❖ Collaborating to the OpenEO implementation working group
- ❖ Trying to collaborate more !

Point of contact : hugo.fournier@cnes.fr