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Explore and Analyse Atmospheric Composition – perform multi-domain correlations with Innovative Online Data Access Services (Data Cubes)

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DLR's EOC Geoservice (<https://geoservice.dlr.de>) is operational for than 10 years and provides access to a multitude of operational EO and EO-related products via OGC-compliant interfaces WMS and WCS. ISO metadata on data collections and products are exposed via standard compliant catalogue services. In order to support the currently arising needs for interoperability and for the analysis of long EO timeseries (big data analytics), innovative technologies and interfaces for data discovery, access and analysis were investigated and are now implemented. In particular to facilitate improved EO-(meta-)data discovery, the STAC API (SpatioTemporal Asset Catalogue) is provided by the EOC Geoservice besides the "traditional" OpenSearch API.

STAC is an extremely powerful interface: It supports simplified "human" discovery of EO data collections and dedicated EO products in the webbrowser (to identify individual scenes or products) as well as powerful machine-to-machine-interfaces for EO-product discovery according to spatio-temporal selection criteria.

The STAC-API allows to easily access published datasets via data cube concepts, supporting direct integration in operational processing environments or into interactive Jupyter notebooks. In Python, discovery and access of data products according to spatio-temporal user requirements can be implemented in only a few lines of simple code.

All required interpolation and data slicing is completely performed on the server. This supports perfect interoperability: EO-products originated from different providers can simply be interpolated onto an identical spatio-temporal grid for further analysis on the client side. Only preprocessed (sliced and/or interpolated) data is transferred to the client, significantly reducing required bandwidth.

Among the suite of value-added EO-products available at the EOC Geoservice are a variety of atmosphere-related Level-3 EO-products from GOME-2/MetOp-A/B/C as well as innovative Level 3 trace gas, cloud and radiation products derived from Sentinel-5P/TROPOMI observations. This also accounts for assimilated trace gas concentrations based on Sentinel-5P-observations. This hourly

Level 4-product is generated by the POLYPHEMUS/DLR-system. In addition, value-added EO-products such as the World Settlement Footprint (WSF) can be accessed at EOC Geoservice: They allow correlation to spatio-temporal patterns of anthropogenic activity.

As soon as they become available, Level 3 and Level 4 EO-products from Sentinel 4 (geostationary) and Sentinel 5 (LEO) will become discoverable via EOC Geoservice's STAC interface.

With respect to STAC, most recent improvements (including feasibility studies, development and implementation into EOC Geoservice's operational environment) have been funded in the framework of the ESA GSTP-project "Technologies for the Management of Long EO Data Time Series" (LOOSE). Integration of innovative interfaces into an operational data discovery, access and analysis service (EOC Geoservice and DataCube) for the Copernicus atmospheric composition missions Sentinel-5P, Sentinel-4 and Sentinel-5 is supported by the DLR programmatic project "Innovative Produktentwicklung zur Analyse der Atmosphärenzusammensetzung" (INPULS).