Flood Monitoring using ACube - An Austrian Data Cube Solution

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Geospatial data come in various formats and originate from different sensors and data providers. This poses a challenge to users when aiming to combine or simultaneously access them. To overcome these obstacles, an easy-to-use data cube solution was designed for the Austrian user community and gathers various relevant and near real-time datasets. Here we show how such a system can be used for flood monitoring.

In 2018, a joint project between the Earth Observation Data Centre for Water Resource Monitoring (EODC), TU Wien and BOKU has led to the emergence of the Austrian Data Cube (ACube). ACube implements the generic Python software from Open Data Cube, but further tailors it to national needs of Austrian ministries, universities or smaller companies. With user-driven input coming from all these partners, datasets and metadata attributes have been defined to facilitate query operations and data analysis. A focus was put on high-resolution remote sensing data from the Copernicus programme. This includes C-band radar backscatter, various optical bands, Surface Soil Moisture (SSM), Normalized Difference Vegetation Index (NDVI), Leaf Area Index (LAI), Fraction of Absorbed Photosynthetically Active Radiation (fAPAR), and monthly composites with pixel spacings varying between 10 and 500m. Static data like a digital elevation model (DEM), i.e. the EU-DEM, also reside next to the aforementioned dynamic datasets. Moreover, ACube offers different possibilities for data visualisation through QGIS or JupyterHub and, most importantly, enables access to a High Performance Computing (HPC) environment connected to a Petabyte-scale storage.

The ACube, as a centralised platform and interface to high-resolution datasets, prepares ground for many applications, e.g., land cover classification, snow melt monitoring, grassland yield estimation, land slide and flood detection. With a focus on the latter use case, first analyses based on Sentinel-1 radar backscatter data have already shown promising results. A near real-time fusion of radar, optical and ancillary data (DEM, land cover, etc.) through machine learning techniques could further improve an indication of flood events. Building a dedicated web service is foreseen as an upcoming action, relying on the latest data and the HPC environment in the background. Such an emergency service would provide much potential for authorities and users to assess damages, and also to determine vulnerability to progressing flooding.

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