Geophysical Research Abstracts
Vol. 21, EGU2019-9737, 2019
EGU General Assembly 2019

openEO analyses Earth Observation data based on user-defined raster and vector data cube views

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Data cubes sample or tesselate space, time and other data dimensions using a regular or irregular discretization of the data dimensions. For spatial raster data, the sampling or tesselation of the two or three spatial dimensions is independent, leading to col/row(/layer) indexes typically representing x, y and z directions, where for spatial vector data they are not sampled or tesselated independently, leading to a (one-dimensional) sequence of points, triangles, or polygons. A user-defined data cube view specifies on-the-fly data cube dimension settings (sampling, tesselation), on the basis of which datasets will be analysed and/or merged, without requiring that a dataset is observed, or resampled to these dimension parameters prior to the user setting this view. Analysing data with this approach has two important advantages. First, the user may have other requirements to a target data cube dimension settings than the producer of the pre-computed mosaics, for instance coming from the need to integrate the data with another data set with different data cube dimensions. Second, different compute back-ends allowing for on-the-fly data cube settings but serving identical datasets can be compared (validated) in terms of reproducing the same results on identical requests, which is not possible when two back-ends provide pre-computed mosaics using different mosaicing procedures. Although this approach may sound computationally expensive and slow, two currently operational and accessible examples (Sentinel-Hub and Google Earth Engine) demonstrate that analysis can be fast and interactive by developing models on a coarse scale using simple sampling methods (e.g. nearest neighbour) and pre-computed image pyramids, while postponing computationally expensive large-scale jobs to batch processing mode. The user-defined data cube view proposed by openEO, with realistic and meaningful data cube settings, may enable the integration of very diverse Earth Observation datasets potentially hosted on different backends.