Calibration and Validation activities with the Virtual Research Environment for Atmospheric Missions (VEEDAM)

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The scientific and industrial communities are being confronted with a strong increase of Earth Observation (EO) satellite missions and related data. This is in particular the case for the Atmospheric Sciences communities, with the already launched Copernicus Sentinel-5 Precursor and the upcoming Sentinel-4, -5 and -3B, and ESA's Earth Explorers scientific satellites ADM-Aeolus and EarthCARE. The challenge is not only to manage the large volume of data generated by each mission / sensor, but also to allow users to analyze the data streams in near-real-time and for long-term monitoring tasks. Creating synergies among the different datasets will be key to exploit the full potential of the available information.

As a preparation activity supporting scientific data exploitation for Earth Explorer and Sentinel atmospheric missions, ESA funded the "Technology and Atmospheric Mission Platform" (TAMP) [1] [2]) project, with the twofold aim of demonstrating (1) that multiple data sources (satellite-based data, numerical model data, and ground measurements) can be simultaneously exploited by users (mainly scientists), and (2) that a fully virtualized environment (Virtual Research Environment, VRE) that allows avoiding downloading all data locally, and retrieving only the processing results, is the optimal solution.

With the "Virtual Exploitation Environment Demonstration for Atmospheric Missions" (VEEDAM) project, the concept of VRE is further extended: a Jupyter notebook interface has been deployed aside of the data; the interactive 3D visualization capabilities of TAMP have been evolved providing geographic (latitude, longitude, height) slicing capabilities; further validation data will be automatically included within the system (Pandonia, Actris); new functionalities (e.g. the interpolation of satellite / model data to LIDAR locations of EARLINET network) will be provided.

The improved TAMP platform provides a quick and effective tool for data visualization and validation activities, enabling multi-source data access, allowing calibration and validation activities either on the web portal or on the Jupyter notebook, leaving at the same time the user the possibility to download original data and processing results.

In the framework of the current work the use of the TAMP platform to compare various satellite data products with numerical models and ground measurements is provided, to demonstrate the usefulness and the flexibility of the VRE concept in data visualization, analysis and calibration&validation activities.

[1] TAMP platform landing page http://vtpip.zamg.ac.at/
[2] TAMP introductory video https://www.youtube.com/watch?v=xWiy8h1oXQY