Defining validation protocols for space-borne aerosol and cloud profile products

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Validation activities are critical to ensure the quality, credibility, and integrity of Earth observation data. With the deployment of advanced active remote sensors in space, a clear need arises for establishing best practices in the field of cloud and aerosol profile validation. The upcoming EarthCARE ESA-JAXA mission brings several validation challenges arising from the multi-sensor complexity/diversity and the innovation of its standalone and synergistic products. EarthCARE is capable of performing range-resolved measurements of clouds and aerosols, which are demanding in terms of validation needs and related protocols.

With the involvement of international ground-based networks and airborne facilities in the EarthCARE validation community, there will be a wealth of correlative datasets for Cal/Val purposes. Efficient coordination is needed between the instrument PIs (orbital and suborbital), the validation teams from related missions, the algorithm teams, and the end-user community (e.g., the Climate Change Initiative and Copernicus Earth observation program). The building blocks in this procedure will be lessons learned from previous Cal/Val studies (including CALIPSO, Cloudsat, GPM, and Aeolus), as well as well-established QC/QA procedures adopted by the related European Research Infrastructures and metrological institutes (e.g., ACTRIS, AERONET). The approach will evolve from a review of the current literature, and will be consolidated in consultation with the community at workshops and via the EarthCARE Validation portal.

The presentation will address the development status of the protocols, including lessons learned from Aeolus validation during the airborne and ground-based campaign JATAC (Joint Aeolus Tropical Atlantic Campaign) which took place in Cabo Verde in September 2021. Contributions from the cloud and aerosol communities are expected to gradually broaden the coverage of the validation protocols. While initially focusing on EarthCARE, the best validation practices could be extended to other current and future missions (e.g., ESA Aeolus and its follow on mission, NASA EOS/AOS i.e. Earth System Observatory / Atmosphere Observing System, and WIVERN i.e. WInd VElocity Radar Nephoscope).