

## **EarthCARE satellite mission: Calibration and Validation activities in the Cyprus region**

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Clouds, aerosols and radiation are key parameters for understanding the climate. Compared to the previous report (AR5) of IPCC, significant progress has been made in understanding cloud processes. However, incorporating clouds, aerosols, and precipitation into climate change prediction models remains a major challenge. The joint European Space Agency (ESA)–Japan Aerospace Exploration Agency (JAXA) Earth Clouds, Aerosol and Radiation Explorer (EarthCARE) satellite mission has been launched on 28 May 2024 to assess how these key parameters are represented in weather and climate models and to improve our understanding of their role in the climate system. Four primary instruments are on board the EarthCARE satellite: the ATmospheric LIDar instrument (ATLID), the Cloud Profiling Radar (CPR), The Multi-Spectral Imager (MSI) and the Broad-Band Radiometer (BBR).

For the EarthCARE mission to be successfully operated, various calibration/validation (cal/val) activities will take place. Cyprus is also participating in these cal/val activities, which are coordinated by the Cyprus Atmospheric Remote Sensing Observatory (CARO) Team of ERATOSTHENES CoE. The CARO station is a National Facility (NF) specializing in the remote sensing of aerosols and clouds, located in Limassol (34.677° N, 33.0375° E) and is equipped with a 35-GHz cloud radar (MIRA-35), a microwave radiometer (HATPRO), a multiwavelength polarization Raman lidar (PollyXT), a wind lidar (Streamline-XR), a ceilometer (OTT/LUFFT CHM15k), and an optical precipitation disdrometer (OTT Parsivel). In this study, we will focus on the aerosol/cloud ground-based measurements provided by the PollyXT lidar which will be used to validate the the Level1 and Level2 products of the ATLID instrument. To achieve this, the ground-based measurements must be converted into ATLID-like profiles using a simulation tool called “CARDINAL campaign tool”. This simulator ensures the retrieval of Level 1 products—attenuated particulate (Mie) backscatter, attenuated molecular (Rayleigh) backscatter, and attenuated cross-polar backscatter—based on the same atmospheric scene as ATLID’s calculations. In addition the PollyXT aerosol profiles will be use to validate the level 2aerosol optical parameters. The validation approach will be presented and discussed for two selected cases: a dust layer observed up to 4 km height and a cloud layer detected between 8 and 12 km.

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