

One Year of EarthCARE ATLID Level 2 Validation at CARO, a Coastal Ground-Based Observatory in Cyprus

Hossein Panahifar¹, Maria Poutli^{1,2}, George Kotsias¹, Athina Savva^{1,2}, Nisantzi^{1,2}, Patric Seifert³, Holger Baars³ and Rodanthe-Elisavet Mamouri^{1,2}

¹ Eratosthenes Centre of Excellence, Limassol, 3012, Cyprus-
hossein.panahifar@eratosthenes.org.cy

² Department of Civil Engineering and Geomatic, Cyprus University of
Technology, Limassol, 3036, Cyprus

³ Leibniz Institute for Tropospheric Research (TROPOS), Leipzig, Germany

Abstract: A statistical analysis is presented based on comparison of the EarthCARE ATLID Level 2 products with measurements from the Cyprus Atmospheric Remote Sensing Observatory (CARO) over one year (01 October 2024 – 01 October 2025). As a multi-instrument station in a unique location, CARO provides observation from a wide variety of atmospheric conditions and participates in the EarthCARE Cal/Val activities through CORAL project (EVID39). During the study period, 65 overpasses were identified within a predefined 100 km distance from the station. The mean particle backscatter and extinction coefficients, lidar ratio, and depolarization ratio were retrieved for each layer from PollyXT and ATLID and subsequently compared using statistical metrics such as mean bias, correlation coefficient, and mean/median values. In addition, ATLID–PollyXT differences within the vertical profiles were analyzed through layer-by-layer distribution and profile statistics. To ensure consistency across cases, we performed our own along-track averaging of 50 km of ATLID recordings, while medium-resolution and low-resolution ATL_EBD_2A datasets also have been used. Along with, assessment of land–sea averaging effects linked to CARO’s coastal location has been performed. Finally, ATLID aerosol type classification (ATL_TC_2A) was also evaluated against the HETEAC-Flex retrievals utilizing ground based PollyXT data to assess consistency in aerosol typing for these cases.

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