

Advancing Atmospheric Research in the Eastern Mediterranean: Insights from the Cyprus Atmospheric Remote Sensing Observatory



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INTRODUCTION

The **Cyprus Atmospheric Remote Sensing Observatory (CARO)** was established within the framework of the **EXCELSIOR** project and operates under the coordination of the Atmospheric Cluster of the Department of Climate and Environment at the **ERATOSTHENES Centre of Excellence (ECoE)**. ECoE-CARO is a National Facility (NF) for remote sensing of aerosol and clouds under labelling procedures to become an ACTRIS National Research Infrastructure facility for Cyprus consisting of the aerosol remote sensing (ARS) observational platform and the cloud remote sensing (CRS) observational platform.

These facilities are used to quantify the different impacts of wildfire smoke, pure and aged in addition to coated mineral dust and urban haze on cloud evolution. Furthermore, CARO actively participates in the EarthCARE satellite validation through the project CORAL (Cyprus Observation for EarthCARE validation), providing ground-truthing observation of the atmosphere's vertical structure. The CARO ground-based high-quality infrastructures with the addition of the new knowledge on modelling related and satellite based atmospheric research through the ATARRI project (ATmospheric and solar AR Research and Innovation in the Eastern Mediterranean), will allow a measurement–modelling synergistic approach dealing with major environmental and atmospheric research and innovation aspects.

What are the most unique advantages of the ECoE-CARO National Facility?

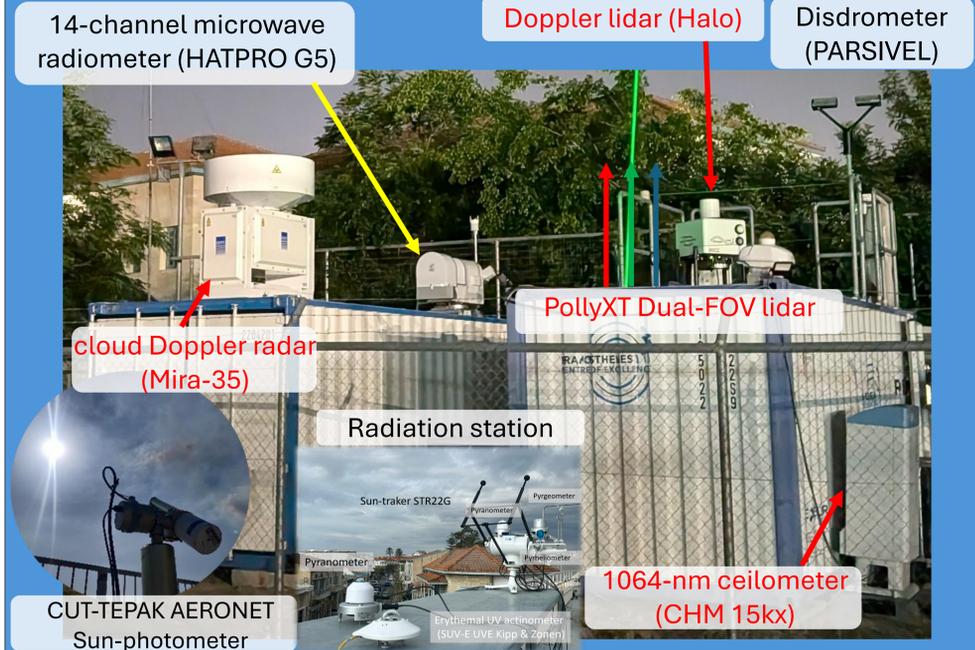
Unique geographical location

CARO atmospheric condition is affected from different sources

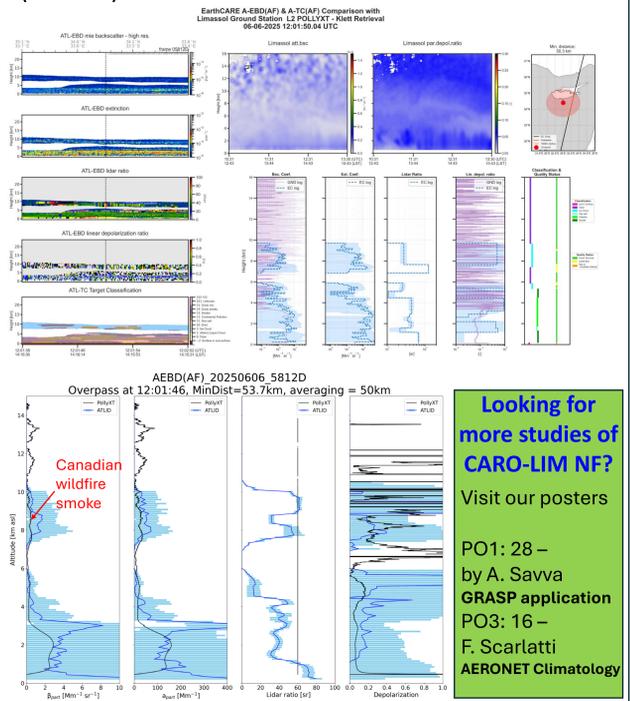


★ The CARO-LIM ACTRIS EARLINET and CLOUDNET station is located at Limassol, a coastal city of Cyprus (34.677°N, 33.0375°E, 2.8 m above sea level)

Comprehensive suite of active and passive instruments to investigate aerosol-cloud-radiation dynamic interaction



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).



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CONCLUSIONS

- CARO provides a multi-instrument synergy in the Eastern Mediterranean, capturing complex aerosol–cloud interactions from diverse sources (Saharan dust, Middle Eastern dust, wildfire smoke, marine aerosols).
- Combined observations from the Mira-35 cloud radar and PollyXT lidar deliver complementary insights into vertical aerosol distribution, cloud microphysics, and precipitation processes.
- EarthCARE ATLID–PollyXT comparisons at CARO highlight the added value of EarthCARE's active remote sensing for detecting and characterizing smoke plumes, while emphasizing the strategic role of ground-based observatories like CARO in improving satellite algorithms and validating mission performance.

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