Enhancing Aerosol characterization through a Virtual Research Environment

3nd ITINERIS General Project Meeting
Rome, September 25th - 26th, 2025

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CNR-IMAA

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-Mission 4 “Education and Research” - Component 2: “From research to business” - Investment 3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”

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AERO-VRE

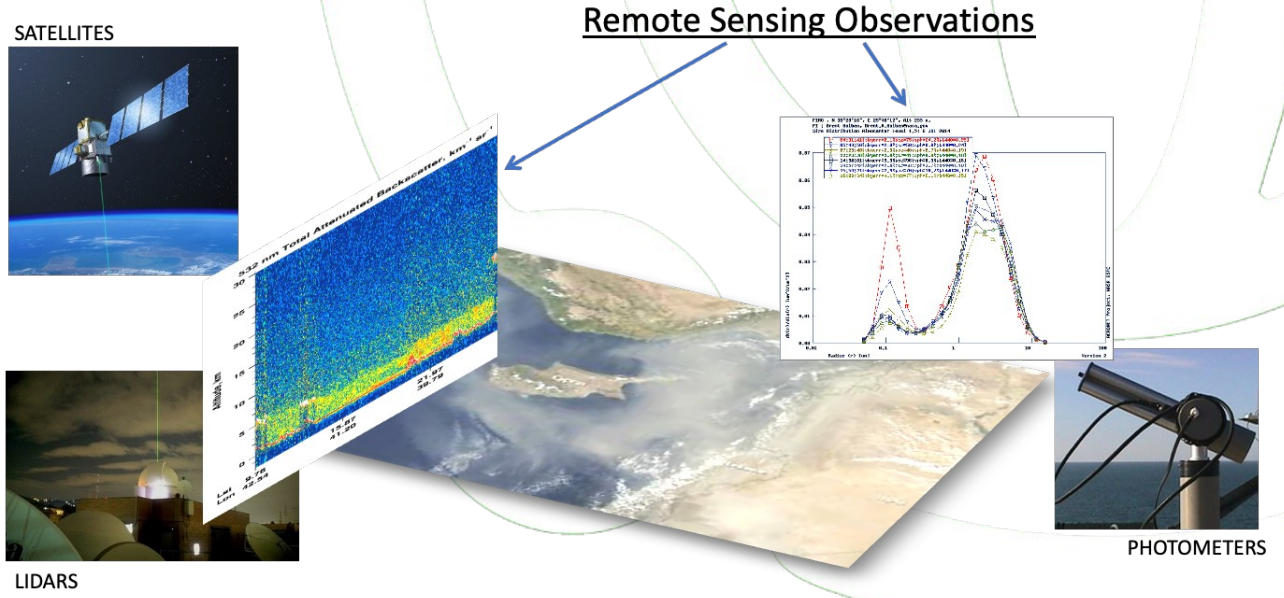
- A user-friendly tool for Desert dust and Typing visualization based on reliable and accessible datasets
- Building on existing datasets available on international datahub
- Pointing on the visualization added value for communication
- Including on top of it ITINERIS produced datasets

- The visual interface allows the users to select:
  - Spatio-temporal domain.
  - Topics of interest to be explored.
  - Specific data product to be visualized.
  - Possibility to download numerical data.

https://itineris.d4science.org/group/itineris_aero

AERO-VRE potential impacts and use

- Interesting tool for researchers for accessing and visually analysing reference datasets providing:
  - Regional insight (WMO-SDS WAS, MONARCH and CAMS models)
  - Columnar information (AERONET measurements + models)
  - Vertical profiles (ACTRIS/EARLINET data and derived products + models)



- The aerosol speciation is also relevant for Air Quality impacts.

  The new Air Quality directive calls for the identification and quantification of dust (and other natural sources) contribution to the PM at the ground.

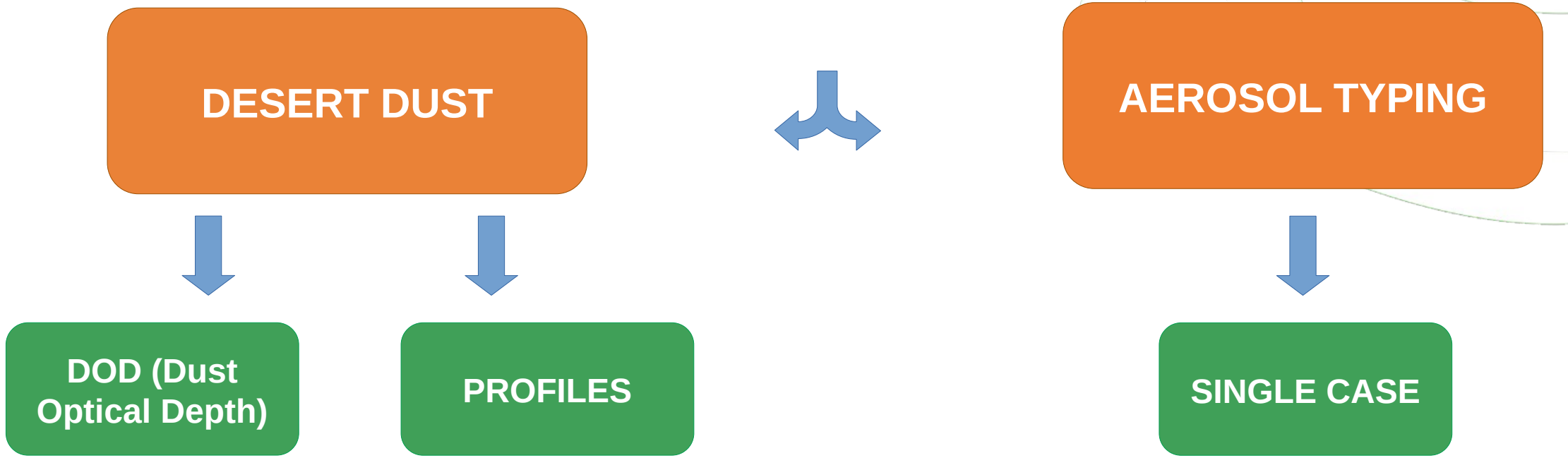
  AERO VRE can support the analysis by the air quality managers.

Structure of AERO-VRE

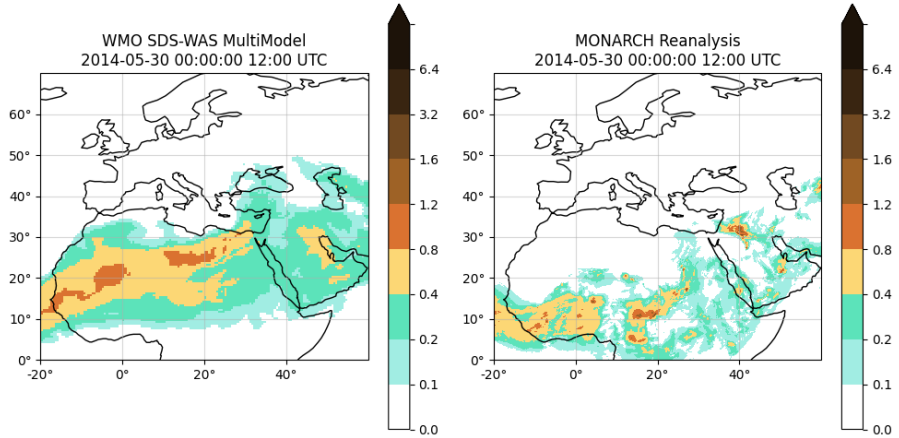
The AERO VRE is divided in two main branches, the **Desert Dust** and the **Aerosol Typing**.

Eight codes have been implemented and released.

Developed with **Python**, **Open Source** and implemented via **CCP** (Cloud Computing Platform)



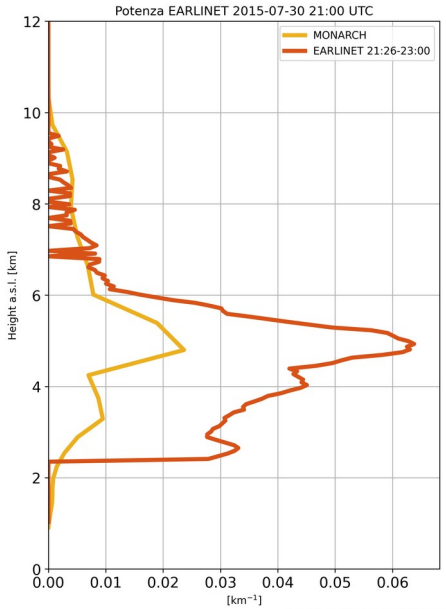
WMO SDS-WAS Multi-Model dust product



Climate data to generate aerosol evolution snapshot on a specific area.
Data from WMO SDS-WAS Multimodel analysis and MONARCH Reanalysis (Di Tomaso et al. ESSD 2022).

DESERT DUST

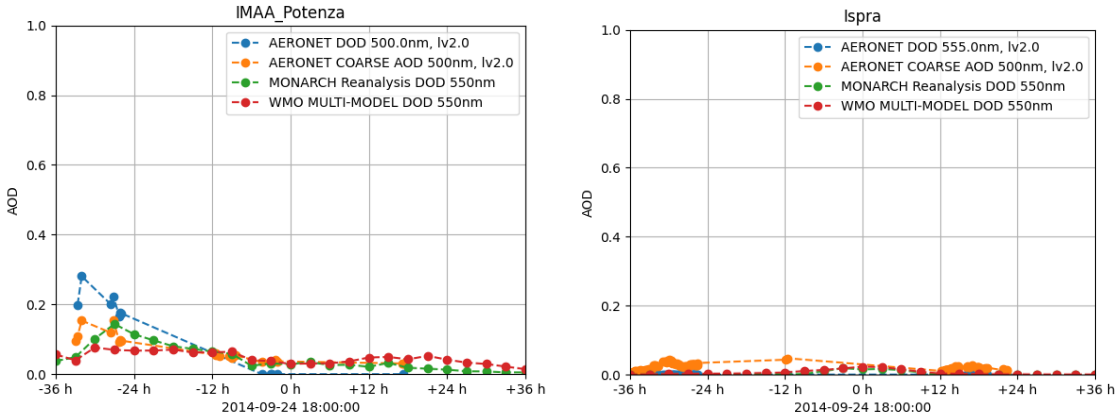
Dust profiles by ACTRIS/EARLINET and MONARCH



Desert dust profiling dataset produced by CNR-IMAA to obtain vertical profiles at 532nm at Potenza and Ispra stations between the years 2015 and 2021.

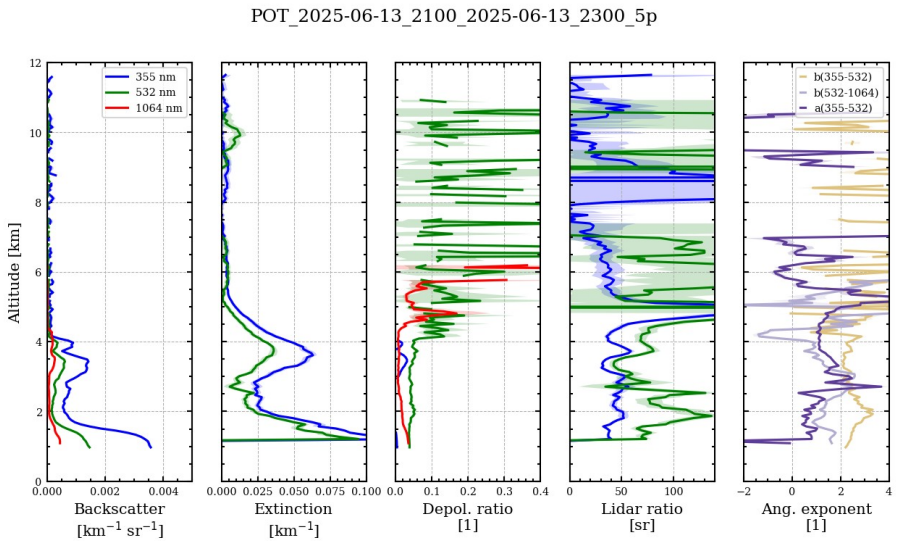
Desert dust profiling product data collection, Italy 2015-2021 by ITINERIS, available at: https://doi.org/10.71763/CNR-IMAA/ITINERIS/DESERT_DUST_PROFILING_PRODUCT/2015-2021/ALL

WMO SDS-WAS + MONARCH + AERONET Dust Optical Depths



Data from AERONET photometric measurements to generate DOD over time, are compared with data from WMO and MONARCH.

Profiles by ACTRIS/EARLINET

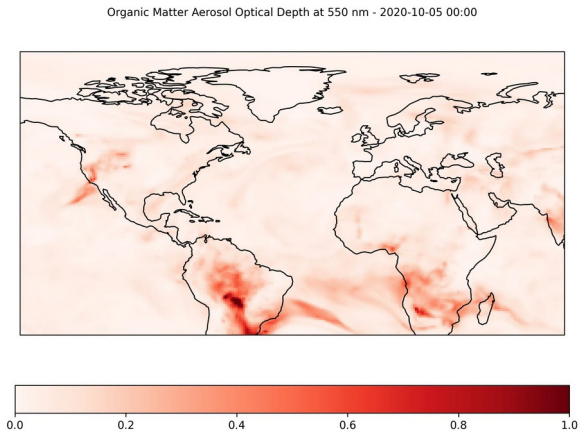


ACTRIS/EARLINET data to produce ***Backscatter***, ***Extinction***, ***Depolarization Ratio***, ***Lidar ratio*** and ***Angstrom Exponent*** plots for a specific site, date and time range.

Data for a specific station are retrieved automatically from **ACTRIS/EARLINET database** via dedicated **API**.

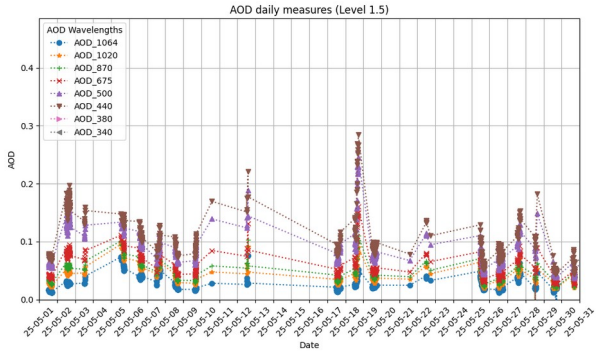
AEROSOL TYPING

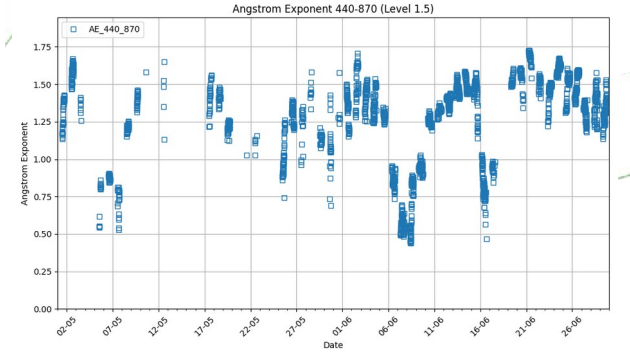
Regional maps by CAMS



CAMS model to generate global-scale high quality 2D maps for the time evolution of Observables. The users will be able to produce their own maps and/or animations by choosing a **specific date** and adjusting **map boundaries**.

Aerosol Optical Depths by AERONET





These utilities use AERONET data to produce daily AOD values at wavelengths 340, 380, 440, 500, 675, 870, 1012, 1064 nm as single measure or daily averages and Angstrom Exponent (440-870).

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