

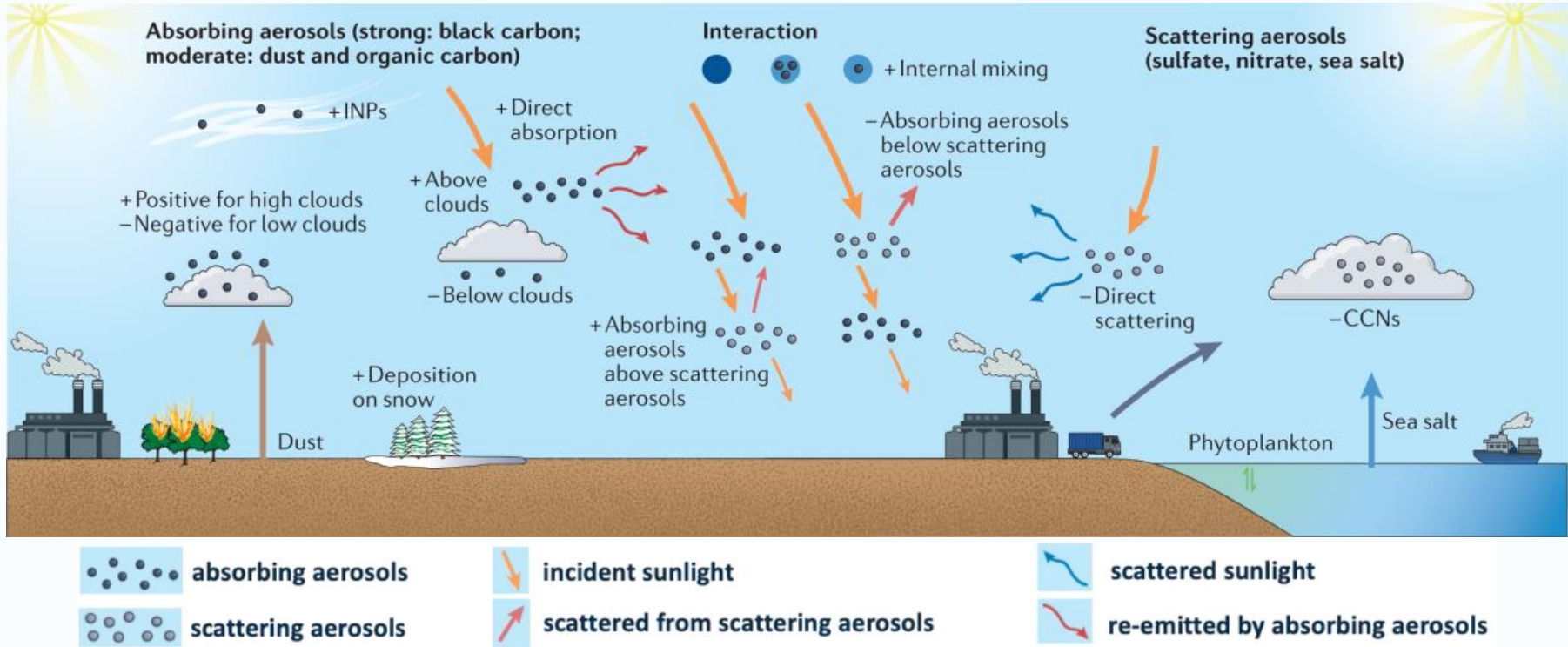
The evolution of the Polar-AOD network

towards a comprehensive repository
supporting efforts for integrated polar
observing systems

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Alice Cavaliere, Claudia Frangipani, Robert Stone, and Vito Vitale

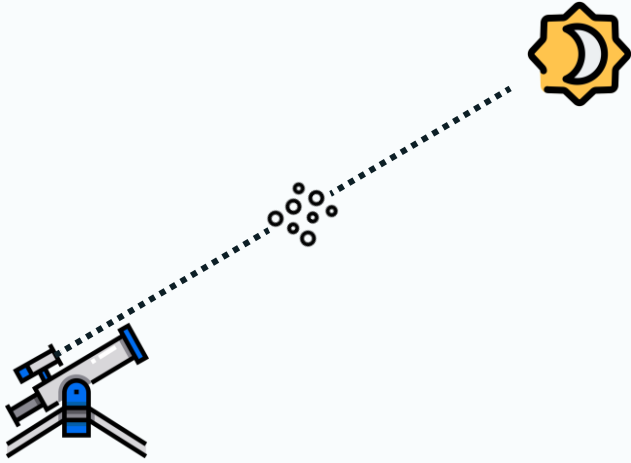


Atmospheric aerosols in Earth climate system



Li J. et al., Scattering and absorbing aerosols in the climate system. Nat Rev Earth Environ 3(2022). <https://doi.org/10.1038/s43017-022-00296-7>

Photometry technique



Main principles of the technique:

- **Measure** the intensity of **direct** solar, lunar, or stellar **radiation**;
- Use the Sun, Moon or Stars as stable light sources;
- Apply the **Beer-Lambert law**;
- Retrieve **Aerosol Optical Thickness** (τ)

$$V_{\lambda} = \frac{V_{0,\lambda}}{R^2} e^{-\tau_{\lambda} m}$$



Remove contribution from Rayleigh scattering and absorbing gases



$$\tau_{\lambda, Aer} = \tau_{\lambda} - \tau_{\lambda, Ray} - \tau_{\lambda, Gas}$$

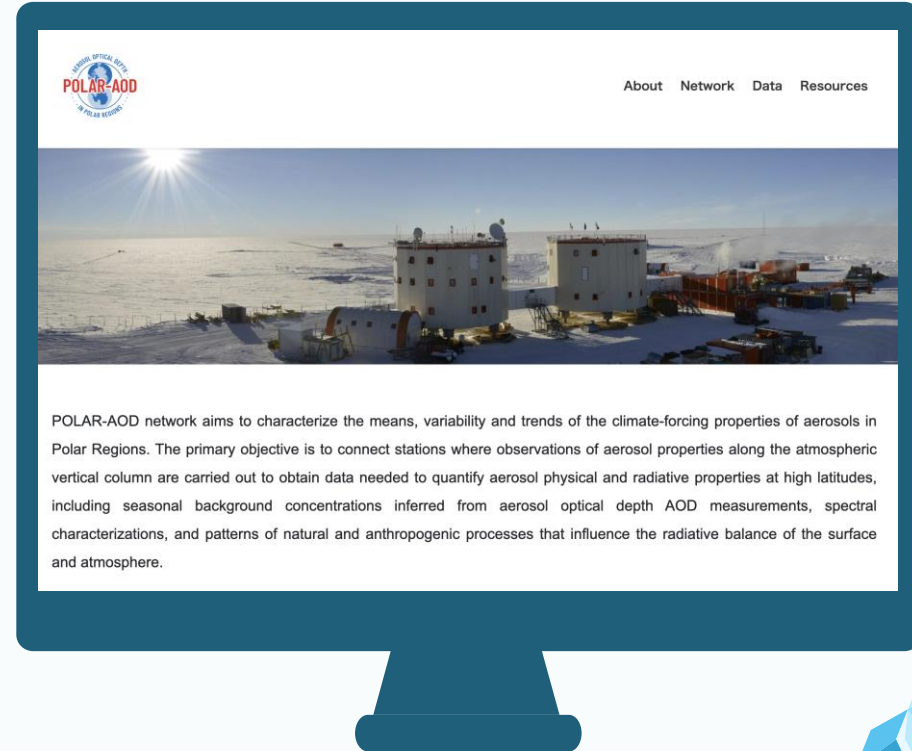
The Polar-AOD project



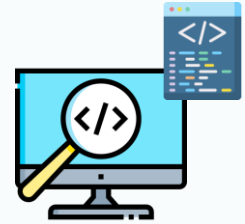
The project standardizes sun-photometer measurements, builds a shared archive of aerosol data, and recovers historical records. By defining background AOD values, it aims to track future changes in the polar atmosphere.

You can visit the Polar-AOD website:

<https://polaraod.net>



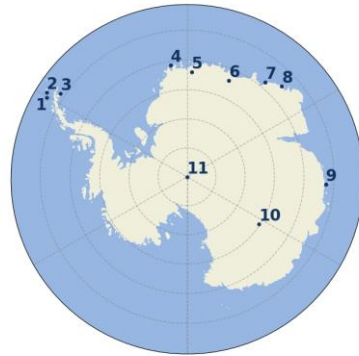
Arctic & Antarctic station in Polar-AOD



For each station in the network, **metadata** is added to **GeoNetwork** [1]



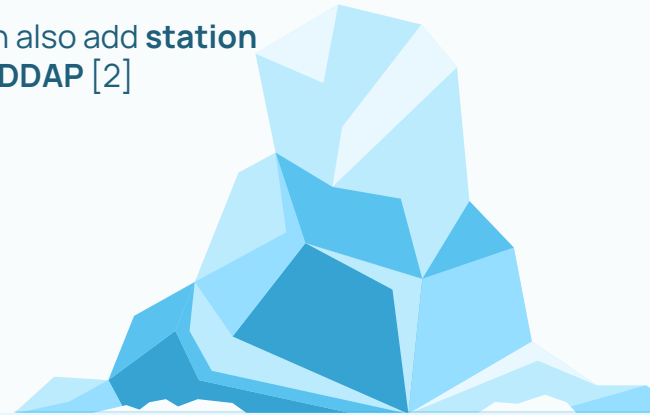
Network > Arctic



Network > Antarctica



Each PI can also add **station data** to **ERDDAP** [2]



[1] <https://geonetwork-opensource.org/>

[2] <https://bo.isp.cnr.it/erddap/information.html>

Marambio station

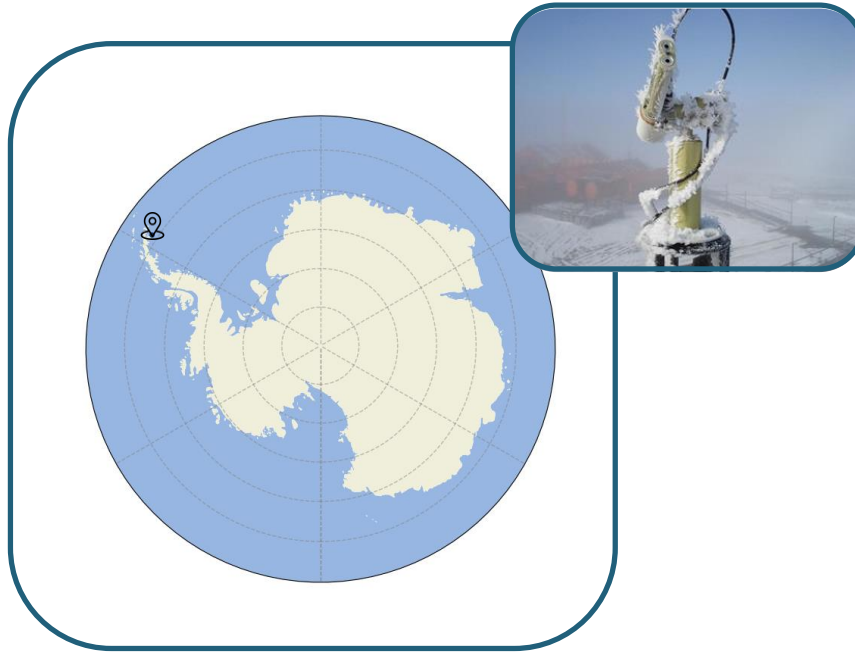


Fig. 1: Location of Marambio station in the Antarctic peninsula

 **AOD Marambio (AERONET)**

Aerosol Optical Depth (AOD) has been measured at Marambio, Antarctica, by Finnish Meteorological institute and University of Valladolid using a CIMEL CE318 photometer since February 2008. The CE318, developed by NASA in 1992, is the reference instrument for automatic multispectral atmospheric photometry and has been continuously improved to meet the requirements of AERONET (AErosol RObotic NETwork). The standard model measures incoming solar radiation at multiple spectral channels, including 340, 380, 440, 500, 675, 870, 937, 1020, and 1640 nm.



Temporal extent
01-02-2008 → Now 31-12-2050

Discover data



Links

 [Marambio AERONET](#) Open link 

Format

[FORMATO_DISTRIBUZIONE_DATI \(ASCII, CSV, Net CDF...\)](#)

Marambio station

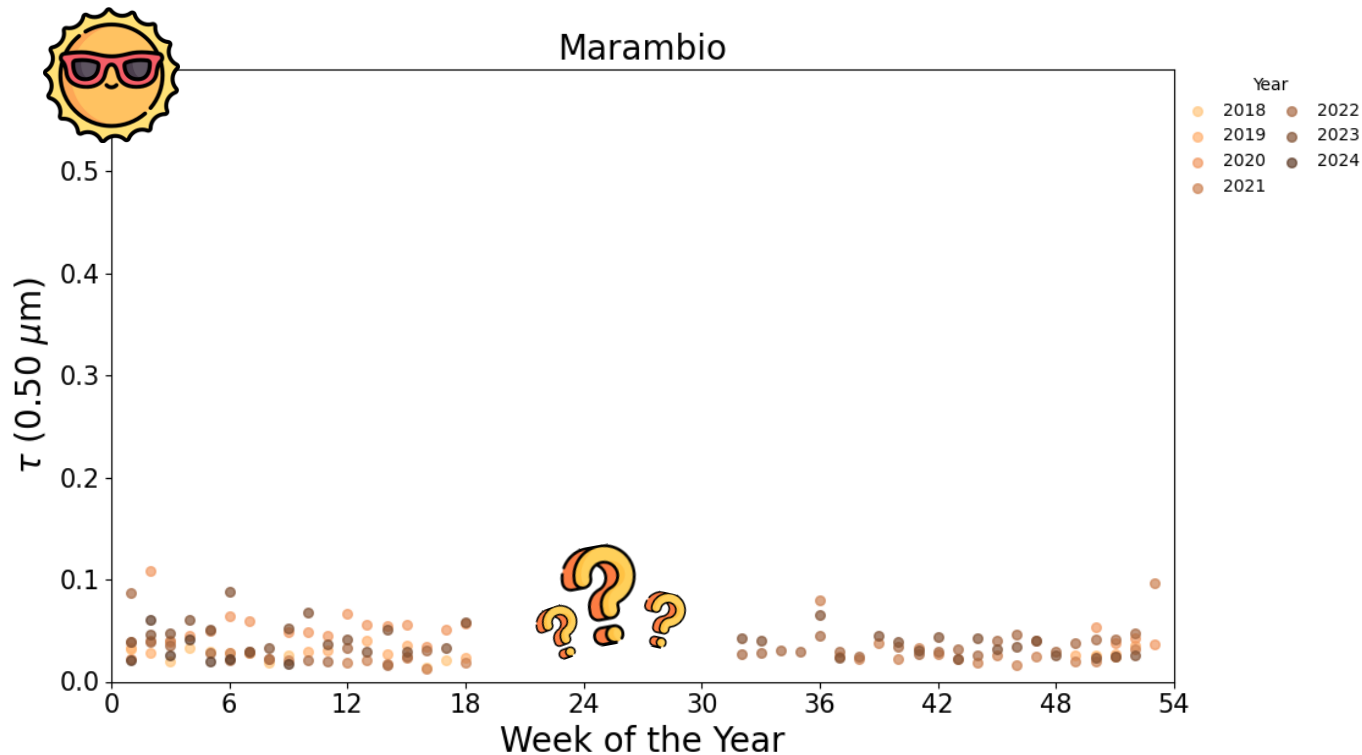


Fig. 2: weekly averages of aerosol optical thickness $\tau(0.50 \mu\text{m})$ at Marambio, Antarctica, between 2018 and 2024.

Marambio station

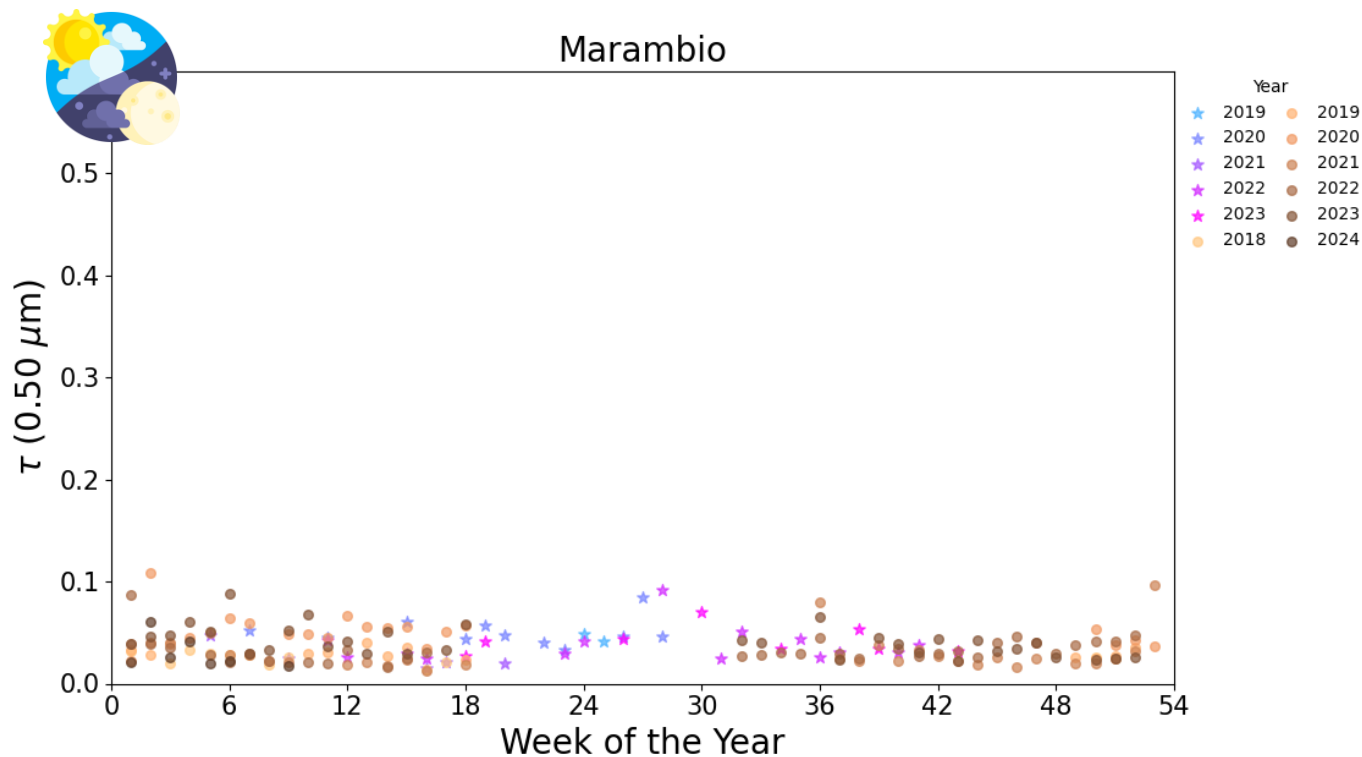


Fig. 3: weekly averages of aerosol optical thickness $\tau(0.50 \mu\text{m})$ at Marambio, Antarctica, between 2018 and 2024 considering both solar and lunar data.



Final remarks

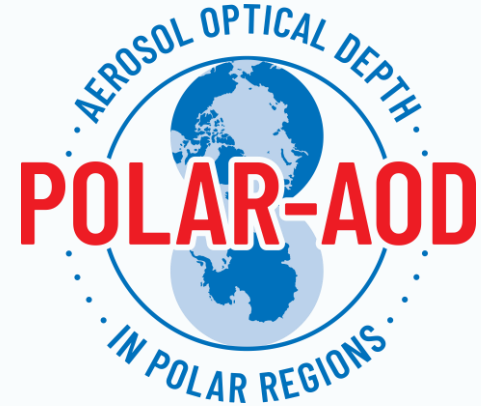
- **Solar, lunar, and stellar photometry** enable year-round AOD monitoring.
- Polar-AOD collects AOD measurements from high-latitude **research stations** and **expeditions**.
- Integration of **all** available **photometer models** ensures comprehensive and versatile AOD data collection.
- **Strengthening collaboration** among scientists for advanced photometric research in polar regions.



Thanks!

Do you have any questions?

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<https://polaraod.net>