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The evolution of the Polar-AOD network: towards a comprehensive repository supporting efforts for integrated polar observing systems

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Atmospheric aerosols play a crucial role in Earth's atmospheric environment and are among its most variable components. In polar regions, aerosols originate from both natural and anthropogenic sources. In the Arctic, the majority of the aerosol mass consists of oceanic sea-salt, mineral dust, non-sea-salt sulphate, and products of biomass burning (Tomasi et al. 2015). In contrast, anthropogenic aerosols are dominated by black carbon (BC) and nitrate, which are signatures of traffic and industrial emissions (Quinn et al. 2007). Polar aerosols can have significant regional effects by interacting with incoming solar radiation and by altering the albedo of the surface-atmosphere system (IPCC 2023). To address and study these effects, the Polar-AOD project was proposed for the first time in 1999 by Claudio Tomasi from the National Research Council of Italy. This initiative aims to characterize the means, variability, and trends of aerosol properties in polar regions. Its primary goal is to connect observational stations measuring aerosol properties along the atmospheric vertical column. These observations provide critical data to quantify aerosol physical and radiative properties at high latitudes, including seasonal background concentrations derived from aerosol optical depth (AOD) measurements, spectral characterizations, and the influence of natural and anthropogenic processes on the radiative balance of the surface and atmosphere. This project fosters collaboration among scientists in the field of photometry at both poles. It also incorporates the stellar and lunar photometry data, which help to address historical gaps in AOD climatologies during the polar night. By filling these gaps, the Polar-AOD project contributes to a comprehensive understanding of aerosol behavior and its impacts on the polar regions. To support this effort, a new web platform has been recently developed to store and share data and metadata from photometric measurements, forming a polar AOD archive. This archive, managed by CNR through GeoNetwork, enables the organization and search of spatially referenced resources while allowing each scientific group to manage its own data, choosing to share metadata only or both data and metadata for specific sites or campaigns within the Polar-AOD network. The new data portal will be presented, along with the maps of the stations and instruments, and the Polar-AOD metadata catalogue.

Bibliography

Intergovernmental Panel on Climate Change (IPCC) (2023). *Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge

Quinn, P. K. et al. (2007), *Arctic haze: current trends and knowledge gaps*, Tellus B, 59(1):99–114. https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1600-0889.2006.00238

Tomasi, C. et al. (2015), *Aerosol remote sensing in polar regions*. Earth-Science Reviews, 140:108–157, 0012-8252, http://dx.doi.org/10.1016/j.earscirev.2014.11.001