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Climatology of aerosol light scattering enhancement factors

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Atmospheric aerosols are able to scatter and absorb solar radiation. The magnitude of the radiative impact of these aerosol optical properties depends on size and composition of the particles as well as on the atmospheric conditions such as relative humidity (RH) and sun angle. Knowledge of the scattering enhancement factor, f(RH), is important for an accurate description of direct aerosol radiative forcing. This factor is defined as the ratio between the scattering coefficient at enhanced relative humidity, RH, to a reference (dry) scattering coefficient.
In this study, f(RH) measurements performed at 26 sites - with a wide global coverage and representing a variety of aerosol types - have been jointly analyzed. This is a completely re-analyzed and harmonized dataset openly available via EBAS (http://ebas.nilu.no/) (Burgos et al., submitted). Most of the stations which provided data are part of active measurement networks such as ACTRIS or NOAA. An identical data treatment process has been applied to all measurements and data quality has been assured by a thorough inspection of each dataset.
In this study, we show the temporal (seasonal and diurnal) and spatial variability of f(RH) measurements. The measurement sites covered different aerosol types from Artic, Marine, Rural to more polluted Urban sites. At most sites f(RH) values do not show a clear diurnal pattern, except for urban sites where the variation is larger likely due to rapid changes in aerosol sources along the day. Furthermore, in this study we explore the relationship between f(RH) and optical variables such as the single scattering albedo or the scattering Angstrom exponent.

Burgos, M.A.. et al., (submitted). A global view on the effect of water uptake on aerosol particle light scattering.