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Aerosol radiative forcing in the European Skynet Radiometers network

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The influence of the atmospheric aerosols is one of the most important factors of the Earth climate system and, despite of our present understanding have increased in last years, they are still one of the largest unknown variables. In fact, recently, the total anthropogenic radiative effect on global scale was estimated to be +1.6 (-1.0 to +0.8) Wm-2, of which -0.5 ($\pm$0.4) Wm-2 are associated to the direct radiative forcing of the atmospheric aerosols.

In order to reduce the current uncertainties of the direct aerosol forcing it is important to accurately determine the aerosol effect by combining modeling techniques with experimental radiation and aerosol measurements. To model the radiative effect of the aerosols, atmospheric radiative transfer models are applied, such as SBDART (Santa Barbara DISORT Atmospheric Radiative Transfer), GAME (Global Atmospheric Model), MODTRAN (Moderate resolution atmospheric Transmission) and RSTAR. With these models, the direct aerosol radiative forcing at ground and top of atmosphere levels is estimated as the difference between the energy flux for an atmosphere with/without aerosols. To estimate the accuracy of the models, the modeled global, diffuse and direct solar radiation at ground level is compared with experimental measurements. To characterize the aerosol properties, sun-sky radiometric measurements at ground level are also needed, usually from systems such as Cimel CE318 or Prede POM.

In last years, a good amount of such studies have been performed for different areas of the world. One of the most promising efforts comes from the AERONET (Aerosol Robotic Network). AERONET is an international operative network of Cimel CE318 sky-sunphotometers that provides the most extensive aerosol database globally available. García et al. (2008) already validated the AERONET direct aerosol forcing methodology with solar radiation measurements from the SolRad-Net (Solar Radiation Network) and BSRN (Baseline Solar Ratiation Network) for a variety of sites.

In contrast to AERONET, the European Skynet Radiometers network (ESR) is a new research network based in Europe and federated with Skynet-Asia, that uses the Prede POM radiometer, but also elaborates Cimel CE318 measurements. ESR algorithms are open and publicly available. Comparison of aerosol properties derived by ESR with AERONET were already performed (Estellés et al., 2012) with good results.

In this study we present a preliminary implementation of a direct aerosol forcing methodology in ESR. The methodology is based on the García et al. (2008) implementation, although it assumes the RSTAR radiative transfer code and the SKYRAD aerosol inversions. Solar radiation data from Burjassot site (Valencia, Spain) and La Laguna (Canary Islands, Spain) are available for the validation, representing urban and maritime/dust environments, respectively.

References

O. García et al., "Validation of AERONET estimates of atmospheric solar fluxes and aerosol radiative forcing by ground-based broadband measurements", J. Geophys. Res. 113 (D21207), 2008.

Estellés et al., "Comparison of AERONET and SKYRAD4.2 inversion products retrieved from a Cimel CE318 sunphotometer", Atmos. Meas. Tech. (in press), 2012.