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Retrieve of aerosol information using spectral data and comparison with MACC forecasts.

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The global energy system has seen a rapid growth of renewable production during the last ten years. The renewable power boom is led by wind and solar technologies. According to the Bloomberg New Energy Finance (BNEF), in the next future the solar production will continue to growth, due to the drastic reduction of technology costs.
The penetration of large amounts of intermittent energy on the grid has driven numerous studies to improving system efficiency on one hand and to better manage the instability of the grid.
For solar plants, different meteorological factors must be taken into account in order to obtain an accurate forecast of the production, in addition to the technical characteristics of the plant.
In presence of cloudiness it is important to characterize the cloud in terms of extension and optical depth, but in clear sky the incident radiation on the plant is mainly affected by the characteristics of the aerosols. In some regions, like desert areas or polluted towns, this factor becomes dominant. For this reason, an accurate forecast of the aerosol type is a hit to obtain a good forecast of the solar components on the ground. Furthermore, the aerosols have very different effects on the various portions of the electromagnetic spectrum. This fact is important especially for concentrated PV system that exploit different bands of direct radiation for electricity generation.
In this study, aerosol information, such as total aerosol optical depth (AOD) for some wavelengths, Rayleigh coefficients for UV, VIS, and NIR have been evaluated using spectral data provided by a Solar Spectral Irradiance Meter (SSIM) located in Milan (Italy), owned by RSE. The retrieved AOD have been compared with the corresponding MACC project outputs, to analyze the correlation with the forecasted AOD, provided by MACC in a specific place, characterized by low winds and high levels of pollution as Milan, located in the Po valley.
By means of a specific algorithm, based on the total AOD and partial optical depths of MACC species, the OPAC aerosol type is identified. This information is used as boundary condition for a modified version of the numerical weather model RAMS. Some results of this test will be shown.
Finally, the MACC AOD forecasts have been also used as input to a radiative transfer model (uvspec using LOWTRAN parameterization, from the package LibRadtran) in order to evaluate spectral radiance in three different bands of the spectrum, centered on 0.6 μm, 0.8 μm and 1.6 wavelength, corresponding to the visible channels of the SEVIRI instrument on board MSG satellite.