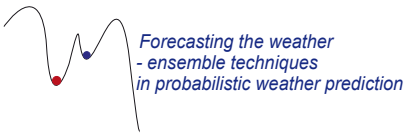
EMS Annual Meeting Abstracts
Vol. 8, EMS2011-488, 2011
11th EMS / 10th ECAM



Satellite data and ground-based instruments for the estimation of solar irradiance at roof level in the alpine region.

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The estimation of solar radiation at ground surface is one most important part in planning solar energy systems in urban environment. The atmospheric composition strongly influences the amount of surface incoming shortwave radiation (SIS) through absorption, reflection and scattering from trace-gases, clouds and aerosols.
Several methods have been developed for retrieving surface global irradiance using satellite observations. At the best of our knowledge, none of them has a spatial resolution capable of describing the PV potential at roof level. Moreover evaluation of SIS in the Alpine regions are still an open issue.
Here we present a three steps approach to estimate SIS at single-roof level for an Alpine town integrating satellite data and ground-based instruments.
First, we developed a WebGIS in which we considered geometrical and topographical aspects and we corrected the modelled clear sky irradiance with the data measured by a ground station in South Tyrol (Italy) on monthly basis. The resulting map shows total annual PV potential for each roof of the city of Bressanone (Italy); and the buildings have been classified according to their capacity to host photovoltaic panels. Many similar platforms have been developed for several towns, but most of them consider the atmospheric effect on solar radiation only through simple parameterizations, based predominantly on climatological values of the Linke turbidity factor.
Second, we describe the role of atmospheric composition in SIS. We use a radiative transfer model (RTM) to compute the direct and diffuse fraction, and to obtain the spectral components. The RTM is coupled with the GIS based model and receive inputs from both ground based instruments and satellite data. For this purpose, we use the new AERONET sun-photometer installed in Bolzano, it measures the amount of direct and diffuse solar radiation at 9 wavelengths.
Third, we analyse the satellite product developed in the framework of CM SAF (Satellite Application Facility for Climate Monitoring) specifically to estimate SIS in the Alpine region. This freely available, high-resolution product is based on METEOSAT Second Generation (MSG) satellite data, and covers less than 5 years. We validate this data-set by using all the available pyranometers in the Alpine region, with the aim to understand whether to use a more extended data-set from MSG satellites and eventually integrate it using high-spatial-resolution MODIS data to describe atmospheric composition.
The final product will be an easily accessible WebGIS showing the solar potential of each single roof in an Alpine town. This instrument could significantly facilitate a first assessment for possible future installation and it could help different actors in the PV environment, like developers, installers, financing institutions, as well as decision-makers and customers.