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New gridded database of clear-sky solar radiation derived from ground-based observations over Europe

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Since aerosols modify the entire energy balance of the climate system through different processes, assessments regarding aerosol multiannual variability are highly required by the climate modelling community. Because of the scarcity of long-term direct aerosol measurements, the retrieval of aerosol data/information from other type of observations or satellite measurements are very relevant. One approach frequently used in the literature is analyze of the clear-sky solar radiation which offer a better overview of changes in aerosol content. In the study first two empirical methods are elaborated in order to separate clear-sky situations from observed values of surface solar radiation available at the World Radiation Data Center (WRDC), St. Petersburg. The daily data has been checked for temporal homogeneity by applying the MASH method (Szentimrey, 2003). In the first approach, clear sky situations are detected based on clearness index, namely the ratio of the surface solar radiation to the extraterrestrial solar irradiation. In the second approach the observed values of surface solar radiation are compared to the climatology of clear-sky surface solar radiation calculated by the MAGIC radiation code (Muller et al. 2009). In both approaches the clear-sky radiation values highly depend on the applied thresholds. In order to eliminate this methodological error a verification of clear-sky detection is envisaged through a comparison with the values obtained by a high time resolution clear-sky detection and interpolation algorithm (Long and Ackermann, 2000) making use of the high quality data from the Baseline Surface Radiation Network (BSRN). As the consequences clear-sky data series are obtained for 118 European meteorological stations. Next a first attempt has been done in order to interpolate the point-wise clear-sky radiation data by applying the MISH (Meteorological Interpolation based on Surface Homogenized Data Basis) method for the spatial interpolation of surface meteorological elements developed at the Hungarian Meteorological Service (Szentimrey 2007). In this way new gridded database of clear-sky solar radiation is created suitable for further investigations regarding the role of aerosols in the energy budget, and also for validations of climate model outputs.

References

1. Long CN, Ackerman TP. 2000. Identification of clear skies from broadband pyranometer measurements and calculation of downwelling shortwave cloud effects, J. Geophys. Res., 105(D12), 15609–15626, doi:10.1029/2000JD900077.

2. Mueller R, Matsoukas C, Gratzki A, Behr H, Hollmann R. 2009. The CM-SAF operational scheme for the satellite based retrieval of solar surface irradiance - a LUT based eigenvector hybrid approach, Remote Sensing of Environment, 113 (5), 1012–1024, doi:10.1016/j.rse.2009. 01.012

3. Szentimrey T. 2014. Multiple Analysis of Series for Homogenization (MASHv3.03), Hungarian Meteorological Service, https://www.met.hu/en/omsz/rendezvenyek/homogenization_and_interpolation/software/

4. Szentimrey T. Bihari Z. 2014: Meteorological Interpolation based on Surface Homogenized Data Basis (MISHv1.03) https://www.met.hu/en/omsz/rendezvenyek/homogenization_and_interpolation/software/