



Global and diffuse solar irradiance modelling over north-western Europe using MAR regional climate model : validation and construction of a 30-year climatology

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Solar irradiance modelling is crucial for solar resource management, photovoltaic production forecasting and for a better integration of solar energy in the electrical grid network. For those reasons, an adapted version of the Modèle Atmosphérique Régional (MAR) is being developed at the Laboratory of Climatology of the University of Liège in order to provide high quality modelling of solar radiation, wind and temperature over north-western Europe. In this new model version, the radiation scheme has been calibrated using solar irradiance *in-situ* measurements and CORINE Land Cover data have been assimilated in order to improve the modelling of 10 m wind speed and near-surface temperature. In this study, MAR is forced at its boundary by ERA-40 reanalysis and its horizontal resolution is 10 kilometres. Diffuse radiation is estimated using global radiation from MAR outputs and a calibrated version of Ruiz-Arias *et al.*, (2010) sigmoid model. This study proposes to evaluate the method performance for global and diffuse radiation modelling at both the hourly and daily time scale using data from the European Solar Radiation Atlas database for the weather stations of Uccle (Belgium) and Braunschweig (Germany). After that, a 30-year climatology of global and diffuse irradiance for the 1981-2010 period over western Europe is built. The created data set is then analysed in order to highlight possible regional or seasonal trends. The validity of the results is then evaluated after comparison with trends found in *in-situ* data or from different studies from the literature.