



Climatological Analysis of the Solar and Wind Energy Potential in Germany

Uwe Pfeifroth (1), Jaqueline Drücke (1,2), Jörg Trentmann (1), Michael Borsche (1), Frank Kaspar (1), Paul James (1), and Bodo Ahrens (2)

(1) Deutscher Wetterdienst, Climate and Environment, Offenbach, Germany (uwe.pfeifroth@dwd.de), (2) Goethe University Frankfurt, Institute for Atmospheric and Environmental Sciences

Renewable energies, like solar and wind energy, play an important role in current and future energy supply in Germany and Europe. The renewable energy production highly depends on weather which leads to an increasing impact of the meteorological fluctuations on energy production.

Climate data records with high spatial and temporal resolution are used to simulate the solar and wind energy production. For the solar radiation the CM SAF SARA 2.1 data record is appropriate, which includes global and direct radiation, with a temporal resolution of 30 minutes and a grid spacing of 0.05° . The data is available from 1983 to 2017. For wind speed, the regional reanalysis COSMO-REA6 for the period 1995 to 2015 is used, which provides hourly data with a spatial resolution of 6 km. Based on these data records, capacity factors are calculated for solar and wind energy for Germany which describe the ratio between the produced energy and the installed capacity of solar and wind plants.

The main aim of this study is to identify and analyse weather regimes where renewable energy production was extreme. Especially periods with very low energy production, so-called “Dunkelflauten” can be problematic. The simulated capacity factors are compared and evaluated with energy production data for 2015, taking into account the actual generated power as well as the installed capacity of solar and wind plants in Germany, including its spatial distribution. On the basis of the climatological time series of simulated capacity factors, the impact and frequencies of problematical weather regimes are analysed.