EMS Annual Meeting Abstracts
Vol. 13, EMS2016-614, 2016
16th EMS / 11th ECAC

Using high resolution reanalyses for renewable energy applications

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The decisive benefit of renewable energy is its inexhaustibility and the much lower environmental damage during its generation. These properties are the reasons for the present energy transition and the related research interest. One major issue is the spatiotemporal inhomogeneity of renewable energy sources like solar radiation and wind. This inhomogeneity leads to enormous variability in the energy feeds. The increasing part of volatile energy feeds requires stronger efforts of the TSO, DSO and the spot market to ensure the required energy demand. Of great relevance is here the knowledge about where, when and to what extent renewable energy can be generated. Atmospheric reanalyses represent a suitable dataset to investigate the spatiotemporal variability, potential and availability of renewable energy sources.

To investigate the above mentioned questions we use the high resolution reanalyses developed within the Hans-Ertel Centre for Weather Research. The high resolution reanalyses COSMO-REA6 (6 km horizontal resolution, 40 vertical layer) and COSMO-REA2 (2 km horizontal resolution, 50 vertical layer) are based on the NWP model COSMO. REA6 covers the EURO-CORDEX region and REA2 an extended COSMO-DE domain. The coarser reanalysis is available from 1995 to 2014 and the finer from 2007 to 2014.

Due to the fact that reanalyses always provide estimates of the real state of the atmosphere, this study starts with an analysis of the representativity of the relevant quantities wind speed and global radiation. A post-processing is applied to account for deficits in the radiation representativeness. Moreover we will show first results of a subdata set of theoretic energy fields, derived from the post-processed radiation and wind fields from the reanalyses. This data set provides the basis for the investigations of the variability, availability and potential of renewable energy yields. We will also focus on compound events, e.g. a simultaneously reduction of wind and solar energy.