Geophysical Research Abstracts
Vol. 19, EGU2017-13259, 2017
EGU General Assembly 2017

Synoptic versus regional causes of icing on wind turbines at an exposed wind farm site in Germany

Maximilian Weissinger (1), Lukas Strauss (1), Stefano Serafin (1), Manfred Dorninger (1), Thomas Burchhart (2), and Martin Fink (2)

(1) University of Vienna, Department of Meteorology and Geophysics, Vienna, Austria (stefano.serafin@univie.ac.at), (2) VERBUND Hydro Power, Austria

Ice accretion on wind turbine blades can lead to significant power production loss or even permanent structural damage on the turbine. With the ongoing construction of wind farms at sites with increased icing potential in cold climates, accurate icing predictions are needed to optimise power plant operation. To this end, the frequency of occurrence and the causes of meteorological icing need to be better understood.

The project ICE CONTROL, an Austrian research initiative, aims to improve icing forecasts through measurements, probabilistic forecasting, and verification of icing on wind turbine blades. The project focuses on a wind farm site near Ellern, Germany, located on the Hunsrück, a hilly terrain rising above the surrounding plain by 200-300 metres. Production data from the last three winters show that icing events tend to occur more often at the wind turbines on top of the highest hills.

The present study aims to investigate historical cases of wind turbine icing and their meteorological causes at the Ellern wind farm. The data available consists of a three-year period (2013-2016) of operational data from the Ellern wind farm as well as meteorological measurements at nearby stations operated by the German Weather Service (DWD). In addition, radiosondes and weather charts are taken into account. The main objective of this work is, first, to link the local and regional weather conditions to larger-scale weather patterns and prevailing air masses, and second, to determine the types of icing (in-cloud vs. freezing precipitation).

Results show that in most icing cases the cloud base height was below the hub height while the temperature was just below the freezing point. Precipitation was absent in most cases. This suggests that most of the observed icing events were due to in-cloud icing. Icing conditions occurred often (but not exclusively) under specific synoptic-scale weather conditions, such as north-westerly flow advecting maritime polar air masses to Central Europe. In other cases, icing events were favoured by the development of low-level thermal inversions during weak south-easterly flow conditions.