Geophysical Research Abstracts
Vol. 19, EGU2017-14131, 2017
EGU General Assembly 2017

Using long term synthetic time series to assess the impact of meteorological extreme events on renewable energy systems: a case study of wind and hydro power in Sweden

Stefan Höltinger (1), Johannes Schmidt (1), and Elisabeth Weterlund (2)

(1) Institute for Sustainable Economic Development, University of Natural Resources and Life Sciences, Vienna, Austria, (2) Division of Energy Engineering, Luleå University of Technology , Luleå, Sweden

Synthetic time series of renewable energy generation provide important inputs for energy system models that study the transition to low carbon energy systems. The coverage of national energy statistics is usually too short or temporal resolution too low – in particular if meteorological extreme events should be assessed. These extreme events may put high stress on power systems with very high shares of renewables and therefore have to be studied in detail. We use simulated time series of Swedish wind energy generation for a 35 year period based on MERRA reanalysis datasets. The simulation of hydropower generation is more complex and requires hydrological models that combine precipitation data with spatially explicit information on soil type and land cover to simulate river discharge. For this purpose, we use time series of daily river discharge that have been simulated using the open source model HYPE (HYdrological Predictions for the Environment).
We compared the derived time series for wind and hydropower generation in the four Swedish bidding areas with respect to their long-term correlation, patterns of seasonality, and length and duration of extreme events. Preliminary results show that expanding wind power capacities could significantly reduce the overall variability of renewable energy generation. Furthermore, the frequency and duration of extreme production events in a combined wind-hydropower system is lower than in a hydropower system only. Further work will study the need for backup capacities in a future Swedish power system with very high shares of hydro, wind and solar power (>90%).