Geophysical Research Abstracts
Vol. 21, EGU2019-17930, 2019
EGU General Assembly 2019

Analysing the uncertainty of reanalyses to assess the predictability at S2S time-scales of key climate and energy variables for the energy sector

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Variability of meteorological variables at sub-seasonal to seasonal timescales (from3-4 weeks 3-4 months) can have enormous impacts on the renewable energy sector by modifying energy outputs and needs. A decision support tool based on S2S climate predictions co-designed and co-developed with relevant users (energy companies) can make energy sector more resilient to climate variability and high-impact events.
This is the main goal of the S2S4E project funded by the European Horizon 2020 programme and to achieve this goal is necessary to explore the scientific frontiers of S2S predictions. The advancement of the understanding of observational climate data sets, such as meteorological reanalysis, can largely contribute to the development of decision support tool by maximizing the utility of S2S forecasts for the key climate and energy metrics of value to the energy sector.
With the aim to provide an assessment of uncertainty of observational products, a comparison among the observational datasets has been carried out. Several different global reanalyses (ERA-Interim, ERA-5, MERRA-2, JRA-55, NCEP-R2) are analyzed and compared with satellite and in situ observations. Essential climate variables needed for the generation and analysis of energy indicators (such as temperature, solar irradiation, wind speed, precipitation) are assessed. To this end, a set of diagnostics (called "namelist") for climatologies, trends and inter- and intra-annual variability and co-variability of essential climate variables are developed and implemented into the Earth System Model evaluation Tool (ESMValTool).
The ESMVAlTool (Eyring et al., 2016) is a community tool that has so far been mainly used for the evaluation of Earth System Models with observations. However, ESMValTool can more generally be used to compare any pair of datasets against one another, ensuring reproducibility and transparency. Performance metrics are introduced in order to evaluate the quality of datasets according to their ability to reproduce simultaneous, compounds phenomena that can impact the energy sector.
Recommendations to energy users on the choice of observational/reanalysis products are provided in the frame of the European H2020 project S2S4E.