EMS Annual Meeting Abstracts
Vol. 16, EMS2019-390, 2019
© Author(s) 2019. CC Attribution 4.0 License.

Near-surface wind speed and gust in ERA5 across Sweden: towards an improved gust parametrization

Lorenzo Minola (1), Fuqing Zhang (2), Cesar Azorin-Molina (1,3), Hans Hersbach (4), and Deliang Chen (1)

(1) Regional Climate Group, Department of Earth Sciences, University of Gothenburg, Gothenburg, Sweden, (2) Department of Meteorology and Center for Advanced Data Assimilation and Predictability Techniques, Penn State University, University Park, PA (USA), (3) Centro de Investigaciones sobre Desertificación, Consejo Superior de Investigaciones Cientificas (CIDE-CSIC), Montcada, Valencia, Spain, (4) European Centre for Medium-Range Forecasts (ECMWF), Reading, United Kingdom

Driven by the increase of global surface air temperatures, some weather extremes are becoming more frequent and severe, with drastic impacts on human and ecosystems [1]. Among those hazards, windstorms and extreme wind conditions contribute to more than half of the economic losses associated with natural disasters in Europe [2]. Across Scandinavia, the occurrence of wind gust events can affect the aviation security, damage buildings and forests, among others. Due to the difficulty in measuring wind gust and the lack of homogeneous and continuous datasets across Sweden, it is challenging to assess and attribute their changes. Comprehensive extreme wind datasets and analysis can help improving our understanding of these changes and help the society to cope with these changes. Global reanalysis products represent a potential tool for assessing changes and impact of extreme winds, only if their ability in representing observed near-surface wind statistics can be demonstrated.

In this study the new ERA5 reanalysis product [3] is tested for hourly observations of near-surface wind speed (WS) and wind gust (WG) across Sweden for 2013-2017. We found that ERA5 shows better agreement with both WS and WG measurements compared to the previous ERA-Interim reanalysis dataset. Especially across coastal regions, ERA5 has a closer agreement with observed climate statistics. However, larger discrepancies are found across inland and high-altitude regions. The gust parametrization used in ERA5 is further analyzed to better understand if the adopted gust formulation matches the physical processes behind the gust occurrence. Finally, an improved formulation for gust parametrization across Sweden is developed and presented.

References

[1] Emanuel K., 2012: What we know about climate change. 2nd edition. MIT Press: Cambridge, MA, USA, pp 96

[2] Ulbrich U., G. C. Leckebush, and M. G. Donat, 2013: Windstorms, the most costly natural hazard in Europe. In Natural Disasters and Adaptation to Climate Change. Cambridge University Press: Cambridge, UK, pp 109–120

[3] Hersbach, H., B. Bell, P. Berrisford, A. Horányi, J. P. Nicolas, R. Radu, J. Muñoz-Sabater, D. Schepers, A. Simmons, and C. Soci, 2019: ECMWF Global Reanalysis: hello ERA5, goodbye ERA-Interim. ECMWF Newsletter 159, in press.