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## Wind Energy Assessment in Southwestern Europe in December months 2017 to 2020

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Renewable resources are dependent on the variability of weather conditions and thus on the availability of the resource as it is the case of wind energy. The huge expansion of the worldwide wind power capacity to produce electricity makes this technology vulnerable to extreme weather conditions such as those associated with extratropical cyclones and extreme weather events (Gonçalves *et al.*, 2020). This work aims to assess the wind resources available and the wind energy potential (WEP) during recent December months (the years 2017 to 2020) in the southwestern Europe. These winter months were characterized by high impact storms with strong winds associated which caused extensive damage. In this region, a total of 10 intense named storms occurred in December: 2017 (Ana, Bruno, and Carmen); 2018 (Etienne and Flora); 2019 (Daniel, Elsa, and Fabien); 2020 (Dora and Ernest) (IPMA; AEMet; Météo France; 2021). To understand the effect of the strong winds associated with the passage of the storms during these months, the ERA5 Reanalysis 10m wind components (10-meter U and V wind components) are retrieved from the European Centre for Medium Range Weather Forecasts (ECMWF) (Hersbach *et al.*, 2019). The fields were extracted at 00, 06, 12 and 18 UTC (6-hourly data), for the 2017, 2018, 2019 and 2020 December months over a geographical sector that covers the southwestern Europe region (30°N–65°N; 40°W–25°E) and compared to climatological values for the 1981-2010 period. Moreover, the wind energy potential was calculated for the respective December months and the values compared and associated with the values of renewable energy reports available for the Iberian Peninsula and the countries of southwestern Europe. Obtained results show an increase of wind intensity of up to 2 m.s<sup>-1</sup> in southwestern Europe during December 2017 and 2019 and a decrease of 2 m.s<sup>-1</sup> in December 2018, when compared with the respective climatology for the 1981-2010 period. In December 2020, a significant increase of wind intensity reaching up to 2.8 m.s<sup>-1</sup> in the Bay of Biscay region, affecting the Iberian Peninsula and the west coast of France. The increase in wind resource resulted in an increase in wind potential in the months under study. These values are in line with the values of wind energy produced during the months analyzed for the EU-28 countries. Finally, it is shown that the highest values of wind production occurred during the days when the storms hit southwestern Europe.

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