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Low wind spells characterization over Europe as seen from ERA5 reanalysis

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Light wind conditions can be a very relevant feature from the wind power perspective. If such values are below a certain threshold (fixed or relative to some percentile), from the renewable energy production perspective, the amount of such energy is then strongly reduced or even suppressed. Frequency and intensity of such conditions is therefore of high interest, and a characterization of how these conditions can remain in time (during several hours, or days) can be even more important. From a climatic perspective, those episodes could be named as spells. This is the case of dry or wet ones, when referring to precipitation and its absence, or hot or cold ones, when focusing on temperatures. There is plenty of literature focused on that extreme conditions, for example in the set of indices to define extreme events developed by the ETCCDI (the CCI/CLIVAR/JCOMM Expert Team (ET) on Climate Change Detection and Indices: <http://etccdi.pacificclimate.org/>). However, no mention is made to wind there. Here, we will explore the application of those indices for temperature and precipitation, but now applied to wind values, when they remain below normal values during a certain period of time. Several considerations will first be made to define light wind thresholds. Then, the statistical characterization of the persistence of those conditions will be inspected. ERA5 reanalysis over Europe for the last 40 years is used as the database to perform such analysis, at a resolution of 0.25 degrees for the whole region. From ERA5 time frequency, we are able to analyze hourly scales, due to the high time variability of wind, which can be also of quite relevant interest from the energetic resource perspective. We also analyze daily scales, which is more typical from a climatic focus, and see how these results can be related to mean wind conditions at each point. Time climatic variability and spatial obtained patterns are also studied. Results from this work will be useful to advance in a more systematic and rigorous climatic description of such wind conditions, that would be very important from the energy perspective, for example. In particular, we are interested in exploring the recently developed concept of energy droughts (Raynaud et al., 2018).