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Sensitivity analysis of the WRF model to different PBL parameterization schemes for reproducing wind speed fluctuations associated with convective phenomena in the North Sea

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The wind field fluctuations have negative implications in wind power applications where an accurate high temporal resolution wind speed database is required. In particular, for offshore, the most part of these fluctuations is caused by convective atmospheric phenomena that are presented in several ranges of frequency variations: from minutes to hours. Since the Numerical Weather Prediction (NWP) models are considered as suitable tools for several wind energy applications, a comprehensive analysis of their ability for reproducing these fluctuations is required, particularly for reproducing the wind speed fluctuation events associated with the temperature ones. In this work, we assess the reliability of the WRF model for reproducing these fluctuations for different physical configurations as result of to change the Planetary Boundary Layer parameterization scheme, which is proved to be one of the most sensitive for obtaining accurate wind speed estimates. Data employed for the comparison were the wind speed and temperature at 100 meters above the sea level, collected from the Fino 1 offshore platform for a period of seven years. The most extreme fluctuations events were detected based on the Huang-Hilbert transform (HHT), and evaluated using a procedure based on a cross-correlation analysis. This methodology allows to determine if both, the wind speed fluctuations and the temperature fluctuations are well-related, as well as to provide a lag of time between them.