Wind conditions over the Baltic Sea – comparing reanalysis data sets with observations

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The potential of increasing the amount of offshore wind energy production in the Baltic Sea has been of great interest for many countries and wind power companies for a long time. From a meteorological point of view, there are several special wind characteristics that are observed in this area that needs to be taken into consideration when planning for a wind farm. For example, as the Baltic Sea is a semi-enclosed basin surrounded by coastlines in all directions, phenomenon such as low-level jets occur frequently.

In order to create a climatology of the wind conditions over the Baltic Sea, with wind power applications in mind, four different state-of-the-art reanalysis data sets (MERRA2, ERA5, UERRA and NEWA) have been compared with measurements from LiDAR systems and high meteorological towers (Anholt, Finnish Utö, FINO2 and Östergarnsholm). The performance of the data sets has been analyzed in terms of stability and governing synoptic weather conditions as well as seasonal and diurnal variations. By selecting the most suitable reanalysis data set and using the observations to make corrections, a climatology for wind conditions over the Baltic Sea, focusing on the low-level jets, has then been constructed.