Carrier-to-Noise-Threshold Filtering on Off-Shore Wind Lidar Measurements

Wind lidar observations are characterized by a Carrier-to-Noise-Ratio that is often used to filter the observations. The choice of the Carrier-to-Noise-Ratio threshold value for the wind lidar observations is found to have an effect on the climatological wind speed distribution in such a way that when the Carrier-to-Noise-Ratio (CNR) threshold value is increased the wind speed distribution is shifted to higher values. Based on one year of observations carried out with a wind lidar from 126 m to 626 m height at the FINO3 (Forschungsplattform in Nord- und Ostsee Nr. 3) research platform in the North Sea, the effect that the choice of the Carrier-to-Noise threshold value has on the climatology of the wind speed and direction as well as the wind power density in relation to wind energy is illustrated and discussed. In the one-year data set considered here it is found that for thresholds larger than -29 dB, the mean wind speed and wind rose measured by the wind lidar become a function of the threshold value, and for values smaller than ~ -29 dB further decrease of the Carrier-to-Noise-Ratio threshold has a minor effect on the estimated mean wind speed and wind rose. The analysis of the data set from the North Sea shows that the limit for the Carrier-to-Noise-Ratio of the observations should be -29 dB or less to obtain a threshold independent estimate of the mean wind speed and wind rose. Alternatively, all valid observations should be used for the analysis. Although this study is specific for the conditions in the North Sea, we suggest that for a representative estimation of the wind resource with wind lidars, the effect of the CNR threshold filtering on the wind distribution should be studied when the recovery rate is less than 100%.

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