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Offshore atmospheric stability estimation from floating lidar wind profiles

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In this work, we revisit the 2D parametric-solver algorithm [1] to estimate the Obukhov length, and hence, determine atmospheric stability from floating Doppler wind lidar (FDWL) wind profiles. The algorithm fits the wind-profile model derived from Monin-Obukhov similarity theory to the FDWL-measured wind profile by means of a constrained non-linear least squares optimisation. Observational data were gathered at the IJmuiden test site in the North Sea (52.848 N, 3.436 E) between March and June of 2015. The reference Obukhov length was obtained via bulk Richardson number, which was estimated from IJmuiden-mast observations. Comparisons with the reference stability are performed by using a simplified atmospheric stability classification consisting of only three types, namely stable, neutral and unstable. Fairly similar results were obtained from the 2D-estimated and the mast-derived reference stability classifications for the stability behaviour during the time of day as well as for horizontal-wind-speed dependence on the stability type.

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[1] M. P. Araujo da Silva, F. Rocadenbosch, J. Farré-Guarné, A. Salcedo-Bosch, D. González-Marco, and A. Peña, "Assessing obukhov length and friction velocity from floating lidar observations: A data screening and sensitivity computation approach," Remote Sensing, 2022, submitted.