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The need for measuring wind speed and direction at greater heights and at several levels simultaneously gains importance as wind turbines become larger and higher. For this purpose, remote-sensing profilers become very attractive for resource assessment and power performance testing. However, the existing standards only permit the use of cup anemometers as standard instruments. The main issue preventing the use of remote sensors in such standards is the need to maintain the traceability of the measurements in the international standard system. In this paper, we describe a verification procedure for lidar profilers that enables us to achieve the required traceability. The procedure is based on a direct comparison of the measurements from the lidar and reference sensors mounted on a mast at various height levels.

First, the data are corrected and filtered to obtain a representative data set ensuring a repeatable test. Second, a linear regression is applied to the data for each height. The third step is a bin-average analysis of the lidar error, i.e. the difference between the lidar and reference measurements, forming the basis for the ensuing uncertainty estimation. The results of the verification test are both used to correct the lidar measurements and to derive a corresponding uncertainty budget. A significant limitation of the procedure is the considerable uncertainty introduced by the reference sensors themselves. The decision as to whether to apply the derived correction as a lidar calibration or not therefore mainly depends on the interpretation of this reference uncertainty and the assumed and observed biases.

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