A review of turbulence measurements using ground-based wind lidars

A review of turbulence measurements using ground-based wind lidars is carried out. Works performed in the last 30 yr, i.e., from 1972–2012 are analyzed. More than 80% of the work has been carried out in the last 15 yr, i.e., from 1997–2012. New algorithms to process the raw lidar data were pioneered in the first 15 yr, i.e., from 1972–1997, when standard techniques could not be used to measure turbulence. Obtaining unfiltered turbulence statistics from the large probe volume of the lidars has been and still remains the most challenging aspect. Until now, most of the processing algorithms that have been developed have shown that by combining an isotropic turbulence model with raw lidar measurements, we can obtain unfiltered statistics. We believe that an anisotropic turbulence model will provide a more realistic measure of turbulence statistics. Future development in algorithms will depend on whether the unfiltered statistics can be obtained without the aid of any turbulence model. With the tremendous growth of the wind energy sector, we expect that lidars will be used for turbulence measurements much more than ever before.

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