

# ***Interactive comment on “A review of turbulence measurements using ground-based wind lidars” by A. Sathe and J. Mann***

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The discussion paper by Sathe and Mann addresses the state of the art of measuring atmospheric turbulence with ground-based lidars. The main driver for this review are today's necessities in wind engineering and the generation of energy from the wind. Thus, this review addresses a timely issue and should be published.

The major drawback, which is addressed properly in this review, is that reliable measurements of all turbulence parameters with just one lidar are not possible. Full information on all aspects of turbulence can only be obtained from three simultaneously operated lidars staring at one and the same point for a sufficient amount of time ("three-lidar method"). Given the spatial and temporal scales of atmospheric turbulence and

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the technical specifications of today's lidars, a full measurement of atmospheric turbulence with one lidar will never be possible.

Therefore, the paper should conclude in saying that there is no way without the "three-lidar method". All evaluations from one (or even two) lidars will always need the application of assumptions. This is especially true for complex terrain where more and more wind turbines are planned today. Unfortunately, the reliability of the necessary assumptions decreases with increasing complexity of the terrain. Thus, "one-lidar methods" may work in flat homogeneous terrain or over the sea, but they will definitely fail in highly complex terrain.

The outlook should therefore focus on the "three-lidar method" and possible measurement configurations needed to record the most important aspects of atmospheric turbulence. Maybe, one or two more illustrations could be helpful here. They could show how three lidars have to be arranged in order to get maximum benefit from the "three-lidar method". The existing figure only illustrate those configurations which do not yield the full information on atmospheric turbulence.

Relief apart from the quite expensive "three-lidar method" could only come from innovative measurement concepts which are different from today's Doppler wind lidars (e.g., methods exploiting interference patterns). If there is anything like this on the horizon which could be useful for the addressed purposes, a few paragraphs on such ideas could be a perfect complement to the presented review.

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