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The value of Doppler LiDAR systems to monitor turbulence intensity during storm events in Iceland

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Doppler Light Detection and Ranging (LiDAR) system has been used widely to measure wind velocity and atmospheric turbulence profiles. The temporal and spatial scale of atmospheric turbulence is very dynamic, requiring an adequate method to detect and monitor turbulence with high resolution. The Doppler LiDAR system can provide continuous information about the wind field using the Doppler effect form emitted light signals. In this study, we use a Leosphere Windcube 200s LiDAR systems stationed near Reykjavik city Airport and at Keflavik International Airport, Iceland, to evaluate turbulence intensity by estimating eddy dissipation rate (EDR). For this purpose, we retrieved radial wind velocity observations from Velocity Azimuth Display (VAD) scans (360°scans at 15° and 75° elevation angle) to compute EDR. The method was used to monitor and characterize storm events in fall 2016 and the following winter. The preliminary result reveal that the LiDAR observations can detect and quantify atmospheric turbulence with high spatial and temporal resolution. This finding is an important step towards enhanced aviation safety in subpolar climate characterized by sever wind turbulence. Furthermore, the preliminary results indicate that our method could also be used in the future to optimize wind power plants through a better monitoring of wind speeds and atmospheric turbulences.