Helicopter downwash measured by continuous-wave Doppler lidars with agile beam steering - DTU Orbit (01/12/2018)

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A ground-based remote sensing short-range WindScanner with agile beam steering based on a modified ZephIR continuous-wave wind lidar (Light Detection And Ranging) and a double prism arrangement has recently been developed at the Department of Wind Energy at the DTU Risø campus. The WindScanner measures the line-of-sight component of the wind and by rapid steering of the line-of-sight and the focus position, all locations within a cone with a full top angle of 120 can be reached from about 8 meters out to some hundred meters depending on the range resolution needed.

By using three such WindScanners, all three components of the wind can be retrieved. Here, the first mean 2D turbulent wind fields measured in a horizontal and a vertical plane below a hovering search and rescue helicopter are presented. The line-of-sights of two synchronized WindScanners were scanned within the plane of interest. Since both line-of-sights always were inside the plane scanned, the influence of the wind component perpendicular to the plane was avoided. The results indicate that the flow field below a helicopter can be characterized remotely, which can support helicopter optimization regarding, for example, minimizing the risk to aircraft and personnel when operating in a search and rescue role. The results from the application of the short-range WindScanner technology to the complex and turbulent helicopter downwash demonstrates the possibilities also within less demanding flows encountered within complex terrain and wind energy related research for which the WindScanner technology primarily has been developed.

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