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High impact numerical weather forecasts system with Lidar and Drone observations

Novel ground-based lidar and drone-based high-impact numerical weather forecasting (NWF) systems are commercially available for temperature and humidity profiling in low tropospheres and automated observations for the first time.

Raman Lidar provided temperature and humidity profiles with high temporal and vertical resolution in the troposphere. Lidar is a surveying method that measures distance to a target by illuminating the target with laser light and measuring the reflected light with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3-D representations of the target. Raman lidar works by additionally measuring the inelastic backscatter by nitrogen and/or oxygen molecules

The drone provided high quality in-situ observation of various meteorological variables with high temporal and vertical resolution, but flights are complex in high-air conditions, icing conditions and may be restricted by aviation activity. Both observational systems have greatly improved high-impact weather analyzes and forecasts, such as hailstorms and fog in an operational, convection-level NWP framework.

The current operational observing systems fail to provide a satisfactory data of temporally-resolved observations of temperature and humidity in the planetary boundary layer despite their potential positive impact on numerical weather prediction (NWP). This is particularly critical for humidity, which exhibits a very high variability in space and time or for the vertical distribution of temperature, determining the atmosphere's stability. Novel ground based lidar and drone observations can fill this gap and improve high-impact numerical weather forecasts

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