Observing Boundary Layer Properties with Doppler Lidar for Mass-balance Estimates of Greenhouse Gas Emissions

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Scanning Doppler lidar can play an important role in characterizing the boundary layer for mass-balance studies to estimate emissions of greenhouse gases. During several recent studies we deployed a high resolution Doppler lidar (HRDL) to observe local transport and mixing processes. The lidar continuously profiled horizontal wind speed and direction, horizontal and vertical velocity variance, and aerosol backscatter during each experiment. These data were analyzed along with airborne *in situ* measurements of methane concentration to estimate leakage from natural gas wells. Strength of mixing and mixing height were also computed from the lidar observations, and the extended lidar wind record provided daily real-time flight planning information. Figure 1 shows the lidar-measured wind, turbulence and aerosol structure in the boundary layer observed during a 24-hour period in the Uintah basin. We are currently deploying a commercial Doppler lidar for one year to continuously observe the boundary layer as part of the Indianapolis Flux Experiment (INFLUX). Data products will be computed and displayed in real time, and will also be transmitted to Boulder for archival.

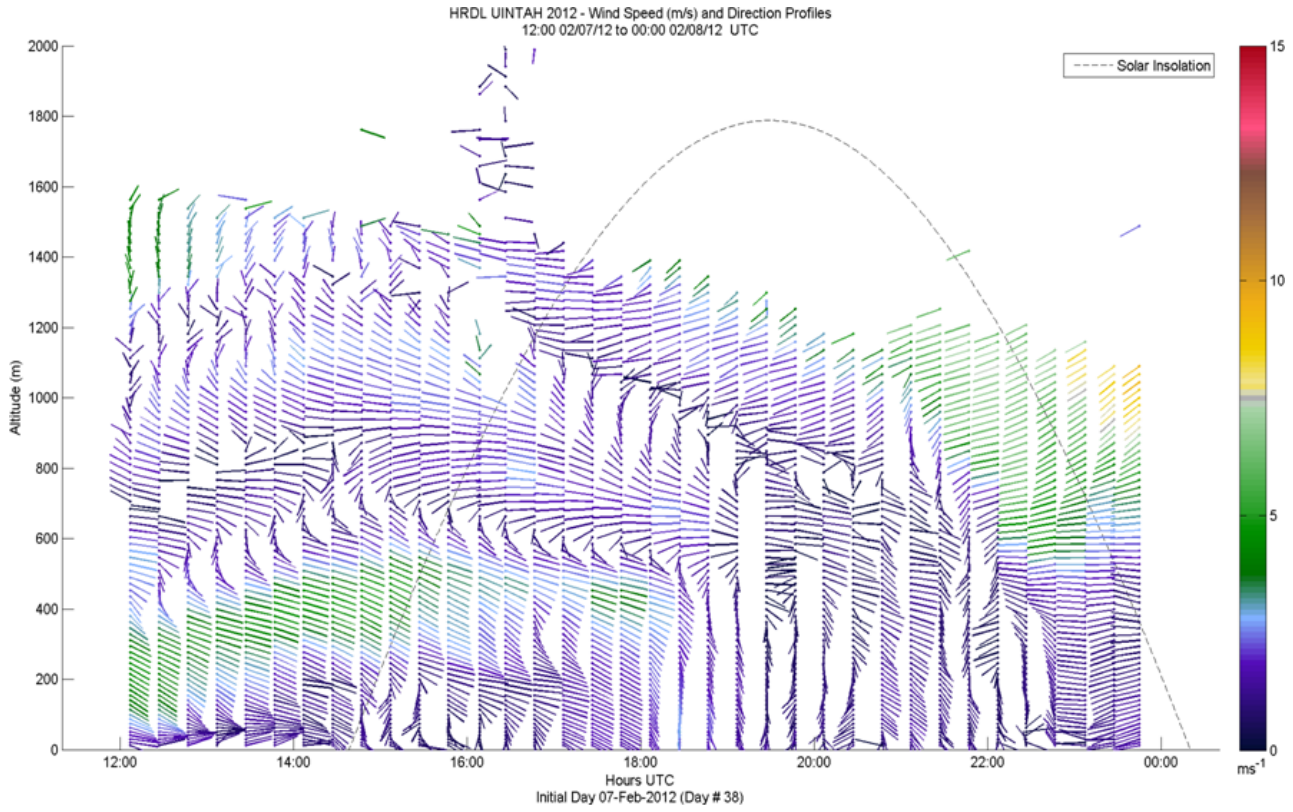

Figure 1. 24-hr time series of wind structure measured by Doppler lidar on February 7, 2012 in the Uintah Basin of Utah, where color of each line indicates speed and orientation of the line indicates direction. The dashed red line indicates the cloud-free solar insolation.