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GLidar - Probing atmospheric convection in complex terrain

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Convection is a major contributor to the overturning of heat, moisture, and momentum in the atmospheric boundary layer and is responsible for the formation of convective clouds and precipitation. However, the characteristic properties, the dynamics, and the processes that trigger and shape the development of atmospheric convection are still only sparsely sampled. In this study, we present an approach to probe and characterise atmospheric convection from both the Eulerian and the Lagrangian perspectives, utilising dual-doppler lidar observations combined with velocity estimates from paraglider and sailplane flight trajectories. Some of the evaluated flights involve additional sensors to sample temperature and humidity. The observations are obtained over the mountainous terrain of southwestern Norway. As a proof-of-concept, we demonstrate the capability of the dual-doppler lidar setup to accurately characterise atmospheric convection and to validate the complementing estimates from the flight tracks in complex terrain. The Lidar setup accurately resolves dynamic properties of the convective circulation with high detail, while the flight tracks resolve the dynamic (and static) properties of the convective updrafts.