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A lee-side eddy and its influence on snow accumulation

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Knowledge of changes in seasonal mountain snow water resources is essential for e.g. hydropower companies. To successfully predict these changes a fundamental understanding of precipitation patterns and their changes in mountainous terrain is needed. Both, snow accumulation and ablation need to be investigated to make precise predictions of the amount of water stored in seasonal snow cover. Only if the processes governing snow accumulation and ablation are understood with sufficient quantitative accuracy, the evolution of snow water resources under a changing climate can be addressed. Additionally, knowledge of detailed snow accumulation patterns is essential to assess avalanche danger. In alpine terrain, snow accumulation is strongly dependent on the local wind field. Based on the concept of preferential deposition, reduced snow accumulation is expected on the upper windward slope of a mountain due to updrafts, while enhanced snow accumulation should occur through blocking at the windward foot or due to flow separation on the leeward side. However, the understanding of these processes is mainly based on numerical simulations, as they are hard to measure.

A LiDAR (Light Detection And Ranging) campaign was conducted in October 2015 in the Dischma valley (Davos, CH) to investigate the local flow field in the lee of the Sattelhorn during a one-day snowfall event. The flow field was monitored using a plane position indicator (PPI) scan at 25/28° and a range height indicator (RHI) scan across the Sattelhorn. Additionally, snow height change measurements on the leeward side of the Sattelhorn were performed by terrestrial laser scanning (TLS). Analyses of the flow field in the framework of preferential deposition are in agreement with the concept of flow separation and preferred snow deposition on leeward slopes. A very persistent eddy that formed over the leeward slope of the Sattelhorn detached from the main flow became evident from the retrievals of the RHI scans. An additional flow component around the eastern edge of Sattelhorn introduces a cross-loading component along the Sattelhorn ridge. Snow depth data is, however, only available for the slope and thus covers only the upper part of the eddy. Thus, this winter we will collect more complete snow depth data to reveal the overall influence of the eddy on snow accumulation.