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Wind tunnel observations of drifting snow

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Drifting snow has a significant impact on snow redistribution in mountains, prairies as well as on glaciers, ice shelves, and sea ice. In all these environments, the local mass balance is highly influenced by drifting snow. Understanding the dynamic of snow saltation is crucial to the accurate description of the process.
We applied digital shadowgraphy in a cold wind tunnel to measure drifting snow over natural snow covers. The acquisition and evaluation of time-resolved shadowgraphy images allowed us to resolve a large part of the saltation layer. The technique has been successfully compared to the measurements obtained from a Snow Particle Counter, considered the most robust technique for snow mass-flux measurements so far.
The streamwise snow transport is dominated by large-scale events. The vertical snow transport has a more equal distribution of energy across the scales, similarly to what is observed for the flow turbulence velocities. It is hypothesized that the vertical snow transport is a quantity that reflects the local entrainment of the snow crystals into the saltation layer while the streamwise snow transport results from the streamwise development of the trajectories of the snow particles once entrained, and therefore is rather a non-local quantity.