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Monitoring snow processes in the Ötztal Alps (Austria) and development of an open source snow model framework

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The Rofental is a high Alpine environmental research basin in the Ötztal Alps (Austria, 1890 - 3770 m a.s.l.). The existing measurement network has recently been extended by new stations and sensors that focus on automated recordings of snow cover properties. Core of the network are three automatic weather stations (AWS) that incorporate 10 min. recordings of snow depth (SD), snow water equivalent (SWE), layered snow temperatures, snow surface temperature, snow density, as well as solid and liquid water content of the snowpack. One AWS is extended by a particular setup of two SD and SWE measurements at nearby wind-exposed and sheltered locations, complemented by an acoustic-based snow drift sensor to quantify wind-driven snow redistribution.

We here present analyses of the publicly available data that focus on snow drift events in an avalanche-prone winter season. The two nearby SWE measurements show differences of around 500% of measured peak SWE at a horizontal distance of only 25 m caused by wind-driven redistribution. In addition, the presented data is used to develop and validate the new open source, distributed snow cover model openAMUNDSEN. We evaluate different integrated energy balance and snow layer schemes and compare the data to results of the ESM-SnowMIP project.