

Impact of the Spatiotemporal Variability of the Snowpack Conditions on Liquid Water Fluxes

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ABSTRACT

The gap between the current knowledge of snowpack hydrological processes and the representation of those processes in hydrological models raises concerns about possible bias in long-term projections those models are used for. Improving those models requires a better quantification of the liquid water fluxes within the snowpack and a better qualification of the snowpack structure – flowthrough interrelations. This is especially true in non-mountainous environments where those aspects remain understudied.

Over the last winter, we have deployed a multi-method approach at the Ste Marthe experimental watershed in Quebec to study those questions. This approach combines photogrammetry, repetitive drone-based GPR surveys, multiparameter winter long monitoring as well as field measurements. So far, we have analyzed GPR results and combined those with 3D maps of the snow cover. Preliminary results are promising as we succeeded in isolating spatial variations in the hydrological reaction of the studied areas to rain-on-snow events. In addition, results so far show how combining 1.5 GHz drone-based GPR data to RGB of NIR image-based photogrammetry can produce bulk permittivity maps that provide repetitive insights for studying the hydrological behaviour of the snowpack. The next step will consist of comparing those permittivity maps to liquid water content measurements and tentatively produce series of snow moisture maps.

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