

## REGIONAL RETRIEVAL OF SNOW WATER EQUIVALENT (SWE) USING THERMODYNAMIC SNOW MODELS IN QUÉBEC, CANADA

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### Abstract.

Snow cover plays a key role in the climate system by influencing the transfer of energy, gas and mass between the soil and the atmosphere. In particular, snow water equivalent (SWE) is of primary importance for climatological and hydrological processes and is a good indicator of climate variability and change. Previous efforts in quantifying SWE over land from spaceborne passive microwave measurements have been conducted since the 1980s but an accurate method has yet to be developed for hemispheric-scale studies, and tools such as snow thermodynamic models allow a better understanding of the snow cover and can potentially significantly improve existing snow products at the regional scale.

The use of three snow models (SNOWPACK, CROCUS and SNTHERM) for the prediction of SWE is investigated temporally and spatially through three winter seasons using local and reanalysis meteorological data. Snow measurements from the International Polar Year project 'Variability and Change in the Canadian Cryosphere' are analyzed in order to compare measured SWE with predicted values. Results show that the SWE predictions remain significant through three complete winter seasons (2004-2005, 2005-2006 and 2007-2008) in southern Québec, and fall within the range of intensive localized field measurements in subarctic regions (boreal forest, taïga and tundra environments) when the models are driven with North American Regional Reanalysis (NARR). The correlation coefficient (R) between measured and predicted SWE values ranged between 0.72 and 0.99 for the three models and two seasons evaluated in southern Québec. SWE was predicted accurately within the regional spatial variability measured the IPY field campaign. NARR data allows snow models to be used regionally, and this paper represents a first step for the coupling of reanalysis data and snow models for global SWE retrievals.

**Keywords:** Snow Water Equivalent, snow model, SNOWPACK, CROCUS, SNTHERM, NARR, Southern Canada