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Time-dependent snow-cover mapping algorithm adapted to regional conditions over Eastern Canada using NOAA-AVHRR data

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The snow cover plays an important role in the hydrological cycle of Quebec (Eastern Canada). Consequently, evaluating its spatial extent interests the authorities responsible for the management of water resources, especially hydropower companies. The main objective of this study is the development of a snow-cover mapping algorithm that is specific to each season, varying throughout the season, adapted to conditions over Eastern Canada and to the AVHRR-KLM new generation sensor. The algorithm is tested in a near real-time operational mode, included in the forecasting process of water supplies at Hydro-Quebec. It is made of a combination of six sequential thresholds varying according to the day of the season, going from the least restrictive to the most severe. Two versions of the snow-cover mapping algorithm have been developed: one is specific for autumn (from October 1st to December 31st) and the other for spring (from March 16th to May 31st). To do so pixels samples of snow, no-snow and clouds were identified visually and manually extracted from a selection of 380 images taken during autumn and 253 during spring, over the period 1988 to 2011. Half of pixels samples are dedicated to calibration and the remaining to validate the algorithm itself and to measure its performance. The empirical thresholds are calculated from percentiles of radiometric data (T4, ΔT45, NDVI, ΔT34, A3, A1) of calibration pixels devoted. Thereafter, for each threshold, a polynomial function has been fitted on the variation in percentiles values based on the date of acquisition (in terms of Julia days). The overall success rate is about 96% for both versions of the algorithm. Snow is well classified at a rate of 90% in autumn and 93% in spring; no-snow and clouds are well classified at a rate of 97% and higher. A validation with ground observations at meteorological stations is in underway.