



A new strategy for snow-cover mapping using remote sensing data and ensemble based systems techniques

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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 strategy using remote sensing data and ensemble based systems techniques. Planned to be tested in a near real-time operational mode, this snow-cover mapping strategy has the advantage to provide the probability of a pixel to be snow covered and its uncertainty. Ensemble systems are made of two key components. First, a method is needed to build an ensemble of classifiers that is diverse as much as possible. Second, an approach is required to combine the outputs of individual classifiers that make up the ensemble in such a way that correct decisions are amplified, and incorrect ones are cancelled out. In this study, we demonstrate the potential of ensemble systems to snow-cover mapping using remote sensing data. The chosen classifier is a sequential thresholds algorithm using NOAA-AVHRR data adapted to conditions over Eastern Canada. Its special feature is the use of a combination of six sequential thresholds varying according to the day in the winter season. 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). In order to build the ensemble based system, different versions of the algorithm are created by varying randomly its parameters. One hundred of the versions are included in the ensemble. The probability of a pixel to be snow, no-snow or cloud covered corresponds to the amount of votes the pixel has been classified as such by all classifiers. The overall performance of ensemble based mapping is compared to the overall performance of the chosen classifier, and also with ground observations at meteorological stations.