

Evaluation of distributed snowpack simulation with in-situ and remote sensing information in Arve upper catchment

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The Arve upper catchment is characterized by a high spatial heterogeneity, with altitudes ranging from 1000m to 4800 a.s.l., a significant glaciated area (about a 33%), and is extended over a wide variety of mountain ambients (alpine, subalpine, forested,...). Moreover this valley is high density populated and has an important touristic industry, thus the human infrastructures and also the population are exposed to natural hazards such as avalanches and floods in which snowpack plays a determinant role. Since 2014, the “Arve valley flood prevention research program” is aimed to understand and characterize the different processes that control floods in the area. Thereby one of the main objectives of this research project is to appropriately understand and simulate the snowpack evolution.

This work presents the evaluation of distributed snowpack simulations obtained with Crocus model in the Arve upper catchment. These simulations cover an area of 205km² and simulate the snow cover evolution with a spatial resolution of 250m. The metrological forcing is obtained from SAFRAN reanalysis (the operational French forcing model for Crocus in the Pyrenees and the Alps), and the simulations have been run from 1989 to 2014. Different researches have been already accomplished in this study area, in such a way it is already available a valuable data base of snowpack and glacier mass balance observations, including data manually obtained and from remote sensing techniques. The snowpack simulations have been evaluated with all the available observations of glaciers mass balance within the area (GLACIOCLIM database), and with the MeteoFrance meteorological station. Additionally, the annual elevation of the equilibrium line of different glaciers obtained from satellite images (Landsat, SPOT and ASTER), is compared with this obtained from Crocus simulations. Finally, the daily snow covered area evolution computed from MODIS images has been used to evaluate the snowpack simulations. These evaluations have shown the good performance of Crocus snowpack model on reproducing the snowpack distribution evolution, but also have shown the challenges that are still present nowadays.