Geophysical Research Abstracts
Vol. 12, EGU2010-3445, 2010
EGU General Assembly 2010

Snow Water Equivalent distribution in the Western Alps: the activities in Aosta Valley

Umberto Morra di Cella (1), Edoardo Cremonese (1), Fabrizio Diotri (2), Paolo Pogliotti (1), and Marta Galvagno (1)

(1) ARPA VdA, AGF, Saint Christophe, Italy (e.cremonese@arpa.vda.it), (2) Centro Funzionale Regione Autonoma Valle d'Aosta, Italy

Snow can be seen as a water reservoir; it plays an important role in the hydrological cycle and climatology of the Earth. Its importance is enhanced in mountainous region where yearly streamflow is strongly controlled by snowmelt dynamics. Climate Change can influence precipitation distribution and snow cover persistence and thus can negatively affect water availability. The knowledge of the amount of water stored in the snow, its spatial distribution and its temporal evolution dynamics, is an issue of increasing importance. The Aosta Valley is a region in the western Italian Alps with a continental climate which can be strongly affected by a reduction of water availabilty. For these reasons, from 2006, the Environmental Protection Agency of Aosta Valley (ARPA Valle d'Aosta) is developping modelling activities aiming to monitor Snow Water Equivalent (SWE) distribution at regional scale (3000 Km2). To estimate SWE distribution we need to know the extent of the snow covered area (SCA) and how snow height (SH) and snow density (SD) are distributed in space. Because of the specific spectral reflectance of snow, SCA can be discriminated from snow-free areas using optical remote sensing methods. The MODIS standard snow-cover products (MOD10A2 maximum snow extent - 8 days composite) can be freely downloaded from the web and their spatial resolution (500 m) is well suited for the application at regional scale. Snow height data can be obtained from automatic measurements (ultrasonic distance sensors) done by the regional meteorological station networks or by manual measurements of snow depth, while snow density has to be manually measured in snow pits. It follows that SH dataset are often more data-rich than SD ones. Snow height and snow density spatial distribution is modelled using multiple regression models between the snow parameters and many morphological variables (e.g. elevation, slope, incoming solar radiation, topographical parameters, ...). Regression models are built using a stepwise approach for the selction of the predictors and their accuracy is evaluated using bootsrap procedure and crossvalidation techniques. When this statistical models, describing the spatial distribution of snow height and density, are defined and the snow covered area is obtained from remote sensing data, SWE can be calculated with a simple multiplication of these three factors. Elaborations are done with a monthly frequency in order to get a picture of the temporal evolution of the total amount of water stored in the entire Aosta Valley and to compare the ongoing year with the previous ones.