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Application of a snowpack dynamic model to continuous-time data-series of snow depth and snow water equivalent from three weather stations in the upper Valtellina valley

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In Italian Alps, seasonal snowpack melting generates 40% - 70% of total water in reservoirs. This clarifies how much this process is relevant in the hydrological balance of northern Italy. Located in the central part of Italian Alps, the Valtellina valley has a relevant local production of hydroelectric power, a rich agricultural production and, thanks to its glaciers and the seasonal snowpack, it feeds river discharges towards the metropolitan area of Milan and the Po river basin, especially during spring and summer. Nonetheless, mainly because of scarce instrumentation, seasonal snow dynamics in the same area have been scarcely characterized in the past. Thus, potential impacts of climatic forcings on snowpack dynamics are widely unknown. In this contribution, we apply a simple one-dimensional model of snowpack density, depth and mass content (proposed by De Michele et al. 2013) to continuous-time data from three different sites placed in the upper Valtellina valley. Sites are placed in the western val Grosina valley (Malghera), eastern val Grosina valley (Eita) and in the Cancano valley (Val Cancano). At each site, snow depth, snow water equivalent, air temperature and precipitation are automatically logged, at a resolution of 15 minutes, by means of ultrasonic depth sensors, snow pillows, thermistors and heated rain gauges. The results of this application show that the model can be useful to investigate melting dynamics in Italian Alps, especially in areas of scarce instrumentation.

De Michele, C., Avanzi, F., Ghezzi, A., and Jommi, C.: Investigating the dynamics of bulk snow density in dry and wet conditions using a one-dimensional model, The Cryosphere, 7, 433-444, doi:10.5194/tc-7-433-2013, 2013.