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Monitoring hydrometeorology in mountain catchment, the example of the Vorz (Belledonne, France)

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Nowadays, the understanding of the hydrological processes in mountain areas is a great challenge in the perspective of the climatic evolution and his impacts and consequences. Thus, the phenomena of flash flood or low water level event, water scarcity will be probably more frequency and more intense that today. In this perspective, a hydrometeorological observational network has been installed on a small mountain catchment in the Belledonne massif in French Alps. In this communication, we will present the main results of the past season. We focus on two specifics points: the characteristics of the local meteorology (Temperature and snow) very variable with the elevation and the aspect of the catchment and the snow cover evolution and particularity.

The mountain meteorology is very complex to integrate in the simulation model, but it is essential to correctly model the water balance. Thus, we installed a meteorological observation network on the catchment operational since October 2009. This network is composed of 50 temperature sensors (22 in the air and 16 in the soil) with a maximum sampling of elevation and aspect and a high spatial and temporal resolution. In addition of these sensor, we installed at the same time 3 traditional meteorological stations with greater accurate temperatures sensor, rain gauges and cumulative snow gauges. Using this equipment we are able to calculate different local orogenic and spatial gradient for the temperature and precipitations. The strong spatial variability of our temperature sensors allows calculating hourly temperature maps all over the catchment. The method of calculation and the results and integration in model will be discuss during this communication.

Among all parameters of mountain hydrometerology, one very important to understand is probably the snow. Thus, we develop during this research program an original sensor able to create snow cover map from simple automatic terrestrial photography. These images come from two camera installed on the catchment since October 2009. We will present the techniques of acquisition and treatment and the capacity of the system to generate snow cover maps to obtain different information of spatial and elevation variation of the snow. Indeed, the local variation of quantity of accumulating snow or melting snow can be observe and quantify with this system and allow feeding different snow stock models in the future.

All sensors placed on the catchment will allow better observing and analysing the spatial variability of hydrometerology of mountain catchment according to the elevation, the localisation or the exposure. Moreover with the quantity of sensors and the sampling step we possess a very high density network an a high spatial and temporal resolution of all these parameters. This density and this resolution of the network is expected to compensate the uncertainty lied to meteorological measurement within mountainous region.