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Analysis of mechanisms and effects of snow-melting on the groundwater recharge downstream mountainous watershed in a climate-changing context. Example: the Lignon du Forez watershed, Massif Central, France.

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The aim of this abstract is to present a three years research on a tributary of the Loire River, with a low mountain rain-snow system, the Lignon du Forez.
The goal of this research is to describe the water proportion stored on a solid state on the heads of watershed and the effect of frozen soils on watertable recharge and rivers flows. This research takes place in a climate changing and water-weakening context. This work is a continuance of the hydrogeological and climatic researches on the Monts du Forez led by Etlicher 1986, 1983.
First, the survey will made up of a hydrological monitoring in several stream draining the Mont du Forez mountains, in particular in winter time in order to check the consequences of solid state precipitations on the water stream. This hydrological survey includes a geophysical monitoring of the snow pack (georadar) to quantify the best as possible the snow water equivalent and precipitations-flows relationships.
To determine runoff and infiltration conditions in wintertime, a temperature and moisture monitoring of the soils and air on an entire hydrological cycle will be carried out (TDR probes, winter 2011-2012).
A second part includes the precipitations forecasting function of seasons and land use. A compilation with GIS software and digital modelling will be applied to a sub-basins group then to throughout watershed to make a mapping of precipitations (solid and liquid state), runoff and infiltration. A global and distributed and/or semi-distributed hydrological modelling will be used at the same time of this land mapping.
Lastly, isotopic tools (O16/O18) will provide in a third time to accurate the first simulations obtained with the flow modelling. Then, this modelling will be correlated and integrated in larger scales simulations (upper reaches of river Lignon).

Key words: snow water equivalent, hydrology, snow cover, frozen soils, distributed modelling, water resource, runoff, GIS.

References:

Etlicher B. (1986). Les massifs du Forez, du Pilat et du Vivarais : régionalisation et dynamique des héritages glaciaires et périglaciaires en moyenne montagne cristalline. Thèse de Doctorat d'Etat, Université Lyon II. 687p.
Etlicher B. (1983). Structure du socle et morphogénèse dans les monts du Forez. Rev. géogr. phys. géol. dynam., 24, N°1, p.75-85.
Bayard D., 2003. The effect of seasonal soil Frost on the alpine groundwater recharge including climate change aspects. These, Ecole Polytechnique Fédérale de Lausane.
Fontaine T.A. et al., 2002. Development of a snowfall-snowmelt routine for mountainous terrain for the soil water assessment tool (SWAT). Journal of Hydrology 262 (2002), p.209-223.
Aouad A. et al., 2004. Etude isotopique de la pluie et de la neige sur le Mont Liban : premiers résultats. Hydrological Sciences-Journal des Sciences Hydrologiques, 49(3) juin 2004.
Melesse A.M. et al. 2005. Evaluation of the SWAT model's snowmelt hydrology in a northwestern Minnesota watershed. American Society of Agricultural Engineers vol48(4).
Boe J., 2007. Changement global et cycle hydrologique : une étude de régionalisation sur la France. Thèse, Université de Toulouse III.