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Soil moisture mapping in torrential headwater catchments using a local interpolation method (Draix-Bléone field observatory, South Alps, France)

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Soil moisture is a key parameter that controls runoff processes at the watershed scale. It is characterized by a high area and time variability, controlled by site properties such as soil texture, topography, vegetation cover and climate. Several recent studies showed that changes in water storage was a key variable to understand the distribution of water residence time and the shape of flood's hydrograph (McDonnell and Beven, 2014; Davies and Beven, 2015). Knowledge of high frequency soil moisture variation across scales is a prerequisite for better understanding the areal distribution of runoff generation. The present study has been carried out in the torrential Draix-Bléone's experimental catchments, where water storage processes are expected to occur mainly on the first meter of soil. The 0,86 km2 Laval marly torrential watershed has a peculiar hydrological behavior during flood events with specific discharge among the highest in the world. To better understand the Laval internal behavior and to identify explanatory parameters of runoff generation, additional field equipment has been setup in sub-basins with various land use and morphological characteristics. From fall 2015 onwards this new instrumentation helped to supplement the routine measurements (rainfall rate, streamflow) and to develop a network of high frequency soil water content sensors (moisture probes, mini lysimeter). Data collected since early May and complementary measurement campaigns (itinerant soil moisture measurements, geophysical measurements) make it now possible to propose a soil water content mapping procedure. We use the LISDQS spatial extrapolation model based on a local interpolation method (Joly et. al, 2008). The interpolation is carried out from different geographical variables which are derived from a high resolution DEM (1m LIDAR) and a land cover image. Unlike conventional interpolation procedure, this method takes into account local forcing parameters such as slope, aspect, soil type or land use. Eventually, the model gives insight into a catchment scale distributed high frequency soil moisture dynamics. This analysis is also used to identify the relative impacts of the morphological determinants on soil moisture content.

References :

McDonnell, J.J. and K. Beven, 2014. The future of hydrological science: A (common) path forward ? A call to action aimed at understanding velocities, celerities and residence time distributions of the headwater hydrograph. Water Resources Research, 50, 5342-5350.

Davies A. C. Davies and K. Beven, 2015. Hysteresis and scale in catchment storage, flow and transport. Hydrological Processes, Volume 29, Issue 16 : 3604-3615.

Joly D., Brossard T., Cardot H., Cavailhes J., Hilal M., Wavresky P., 2008. Interpolation par recherche d'information locale. Climatologie, Volume 5 : 27-47.