Geophysical Research Abstracts
Vol. 16, EGU2014-14523-2, 2014
EGU General Assembly 2014

Towards a conceptual framework to understand the effect of connectivity on hydrological signature

Magalie Delmas (1), Stéphane Follain (1), François Colin (1), Armand Crabit (1), Michaël Rabotin (2), and Roger Moussa (2)

(1) Montpellier SupAgro, UMR LISAH (SupAgro - INRA - IRD), Montpellier, France, (2) INRA, UMR LISAH (SupAgro - INRA - IRD), Montpellier, France

Connectivity concept is now widely used in hydrology to understand the transfer of surface water. A major concern is certainly that connectivity consists of i) a permanent connectivity mainly controlled by the catchment morphology, land use and landscape design, and ii) an ephemeral connectivity – depends on all other conditions having a high temporal variability e.g. gullies morphology, soil surface micro-topography etc. Therefore our ability to model both permanent and ephemeral connectivity must improve hydrological response modelling; a crucial needs for poorly gauged catchment.
The aim of this study was to propose an original conceptual framework allowing to capture both connectivity types that are expected to be useful explanatory factors of hydrological dynamic under poorly gauged catchment conditions.
We developed a combined approach applied on a small Mediterranean vineyard catchment located in southern France (40 ha), dominated by hortonian overland flow. On one hand, we conducted a field survey. A soft monitoring was installed to record rainfall and water level within the drainage network at three locations (on one minute time-step - five contrasted rainfall events). Synchronic fine description of landscape geometry was done including human-made structures (permanent connectivity) and we established a detailed statement of erosion marks like gullies and sediment deposit areas that characterize water pathways (ephemeral connectivity). On the other hand, we developed a numerical analysis based on the "width function" concept initially applied to construct geomorphology-based instantaneous unit hydrographs on large watersheds. In the present study, width functions were built using an iterative integration of field survey connectivity constrains on a DEM. Afterwards, hydrological records were used to calibrate the best width function scheme.
The validation step demonstrates the predictive potential of the combined approach to identify effects of the different connectivity types on hydrological response and to establish the watershed connectivity signature.