



Can spatial study of hydrological connectivity explain some behaviors of catchments?

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Erosion is a major threat to European soil. Consequences can be very important both on-site and off-site. Belgian loamy soils are highly vulnerable to this threat because of their natural sensitivity to erosion on the one hand, and because the land is mainly used for intensive agricultural practices on the other hand. Over the last few decades, rising erosion has even been observed in our regions.

This shows the importance of a deeper understanding of the coupled phenomena of runoff and erosion in order to manage soils at catchment scale. Plenty of research have already studied this but all agree to say that it seems to have a non-linear relationship between rainfall and discharge, as well as between rainfall and erosion. For that reason, a new concept has been developed a few years ago: the hydrological connectivity.

Several research have focused on connectivity but up to now, each there are as much definition as papers. In this thesis, it will be important firstly to resume all these definitions to clarify this concept. Secondly, a methodology using various transects on the watershed and some pertinent field measurements will be used. These measurements include spatial distribution of particle size, surface states and soil moisture. A new approach of photogrammetry using an UAV will be used to observe erosion and deposition zones on the watershed. In this framework, several time scales will be studied from the event scale to the annual scale passing by monthly and seasonal scales. All this will serve to progress toward a better understanding of the concept of hydrological connectivity in order to study erosion at catchment scale. The final goal of this study is to describe hydrologically each different part of the catchment and to generalize these behaviors to other catchments with similar properties if possible.

Afterwards, this research will be integrated in an existing (or not) model to improve the modelling of discharge and erosion in the catchment. Thanks to that, a scenario of hydraulic mitigation measures could be proposed in order to reduce runoff and erosion in the catchment. This scenario will include hydraulic, hydrologic but also ecological, landscape and economical points of view.

Key words: catchment, erosion, runoff, modelling, connectivity, UAV, scale, mitigation measures