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Identification of dynamic overbank flow-paths in farmed catchments and effect on surface transfer function

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Overbank flow is one of the main surface routing processes during extreme flood events, it influence the landscape connectivity, and consequently the travel time. In the literature, many applications were conducted on natural basins but very few on anthropogenic farmed basins. Compared to natural basins, the channel network in farmed basins is formed by man-made ditches which generally follows agricultural field limits, and doesn't necessarily follow the steepest slope of surface topography. The aim of this presentation is to develop a methodology to identify possible alternative flow-paths in farmed basins when overbank flow occurs, and impacts on hydrological responses. An automated method was developed to identify types of overbank over each reach of ditches. This method uses GIS and combines a vector representation of the ditch network and a raster digital elevation model. The temporal evolution of the flow-path network was identified for various scenarios of overbank flow. Then, a hydrologic model was used to calculate the geomorphologic instantaneous unit hydrograph (GIUH). The Roujan basin (south of France) was used as an application case. Relations were established between overbank schemes, ditch network geomorphologic characteristics, and the hydrologic response such as peakflow and lag time. Numerical simulations on virtual or ungauged basins and for various overbank schemes enabled to analyse hydrologic properties of the GIUH as a function of topological properties of channel networks and hillslopes, and hydraulic characteristics of flows. The methodology developed remains a first step before a full distributed modelling approach. It enables to characterize the surface transfer GIUH when overbank flow occurs, as a function of geomorphologic properties of the channel network and is useful for applications on ungauged natural and anthropogenic basins (e.g. farmed, urban).