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Response of floodplain sedimentation to catchment disturbances in different environments

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Holocene floodplain sediments are an important environmental archive, that can be accesed for reconstructing the past landscape dynamics either qualitatively (e.g. palynology) and quantitatively (e.g. sediment budgeting). In this study Holocene alluvial sediment deposition in two contrasting Belgian catchments was quantified and dated: the Lienne (148 km^2) in the Ardennes massif and the Dijle (750 km2) in the loess region. These catchments experienced a comparable Holocene climatic variation, but differ in topography and geology with highest relief energy in the Lienne catchment. Land use history also differs with high land use intensities in the Dijle catchment since Roman times, but at least since the Middle Ages there were also large deforestations in the Lienne catchment. Detailed cumulative Holocene sediment deposition was assessed for each catchment using more then 1000 hand augerings. Detailed radiocarbon dating of fluvial deposits was performed in the Dijle catchment, while iron slag was used as a tracer for sediments deposited after 1350 AD in the Lienne catchment.

Results show that sediment deposition is much larger in the Dijle catchment ($\sim$4.5 Mg ha^{-1} catchment area) then in the Lienne catchment ($\sim$0.2 Mg ha^{-1} catchment area). Dating results from the Dijle catchment show an increase of sediment deposition in the late Holocene, first starting in the colluvial valleys and later on prograding towards the main valleys. Variations in sedimentation rates can clearly be related to anthropogenous land use pressure, and the majority of the sediments found in colluvial and alluvial valleys were deposited in the last 4000 years, and in many cases even in the last 1000 years. Variations in sediment deposition within the catchment can partially be explained by differences in river valley physical settings (mainly valley slope), while in other cases hill slope sediment delivery (upstream erosion, connectivity between hill slopes and the river system) is the explaining factor. In the Lienne floodplain, around 80% of the sediments present in the main valley were deposited before 1350AD, thus before the main period of forest clearance. On the other hand, about 50% of the Holocene sediment present in a main tributary (Chavanne) was deposited after 1537 (local start of iron industry). This difference with the main valley can be explained by a difference in physical settings of the river (valley slope, stream power).

These results show that the physical settings of river valleys determine how sensible the river systems are to catchment disturbances. Floodplain deposition is determined by an interplay of hill slope sediment delivery (hill slope erosion and connectivity) and physical settings of the valley itself (valley slope, discharge). As a result, quantification of floodplain deposition alone, cannot be used as a measure for historic soil erosion within a catchment or to determine intensity of human impact on the catchment.