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Response of the Middle Loire River to climatic and environmental changes during the last deglaciation (Val d'Orléans, France)

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In the study of the responses of the major hydrosystems in Western Europe to climatic and environmental variability during the last deglaciation, we studied fluvial archives of the Middle Loire River (the *"val d'Orléans"*, width: 8 km; length: 50 km, *Lat.: 47˚54 N; Long.: 1˚54˚ W*). At this location, the watershed area is 36 000 km^2 extending partly on the *"Massif Central"* (France). We adopted a multi-proxy approach in order 1/ to characterize significant climatic and environmental changes 2/ to analyse the fluvial responses to this variability. The proxies used are the modifications of the river patterns and of the fluvial processes, the periodic development of permafrost, the occurrence of aeolian deposits and the modifications of the vegetation cover. It required an integrated approach [surface morphology, morpho-stratigraphy (core drillings & gravel pits), sedimentology, geophysic, pedology, palynology, and archaeology]. The chronostratigraphic frame was established on the basis of IRSL and radiocarbon datings.

This study shows in the Loire River basin that: 1/ the last deglaciation had for con-

sequences strong amplitude oscillations of the solid and liquid discharges, 2/ the response of the hydrosystem to the deglaciation occurs approximatively between 19 and 11 cal. ka BP. During a first part of the Late Pleniglacial (from 28 to 19 cal. ka BP), the sedimentary balance is positive while the river had a multichannel pattern. The characterization of the development of continuous permafrost gives evidence of periglacial conditions attributed to the coldest phase of the Last Glacial Maximum (Vandenberghe *et al.* 2004). It coincides with the sea-level lowstand (Mix *et al.* 2001). From approximatively 19 to 17 cal. ka BP, an aggradation of the alluvial plain and a multichannel pattern of the river are interpreted as a period of an important solid discharge. The permafrost degradation is inferred from field observations. This episode coincides roughly with the sea-level rise ("meltwater pulse", Clark et al., 2004). From approximatively 17 and 14 cal. ka BP (Oldest Dryas, H1 event), solid and liquid discharges decrease whereas aeolian processes increase (coversand deposits) in a context of "at least" deep seasonal frost and a probable increasing aridity. At the beginning of the Lateglacial, the modification of solid and liquid discharges causes a shift from a multichannel pattern to a pattern characterised by some large stable channels. The sinuosity of theses channel is low and a downcutting is noted (Bolling and Allerod). Near 12 cal. ka BP (Younger Dryas), the sedimentary accumulation rate is increasing while a "at least" deep seasonal frost is inferred from field observations. A second aeolian event with dunes formation is suspected. The Lateglacial / Holocene transition is characterized by a downcutting phase correlated with the fast climatic warming and the vegetation development of the Preboreal period.

The continuation of this study will allow a better understanding of, 1/ the reactivation of the hydrological cycle and 2/ the transfers of continentally material and water to the ocean from 28 to 10 cal. ka BP. It will allow besides to specify the reconstructions of palaeoenvironments and palaeoclimatic variability in the mid-latitude Western Europe during the last deglaciation.

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