Fluvial-tidal sequences in the Pleistocene terrace system: examples from the Lower Seine Valley (NW, France)

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Abstract

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The Pleistocene terrace system in the lower Seine valley provides an excellent opportunity for assessing the role of sea level and climatic changes on coastal fluvial system deposited in areas of slow tectonic uplift. On the one hand, the Seine River was an important braided-river flowing into the Channel during the Plio-Pleistocene cold periods. Height major cut-and-fill terraces have been recognized from Les Andelys to Le Havre. During major marine lowstands, the braided Seine River flow was able to erode, transport and rework bed material over large distances. On the other hand, marine highstands (*e.g.,* Marine Isotopic Stages 5e, 7, 9 or 11) allow the lower valley to trap silty and sandy sediments supplied by a meandering reach as the present day valley. However, few studies focused on the effects of sea level change on fluvial architecture during the Pleistocene. A clear understanding of both fluvial and marine sources is required to discuss the long-term landscape evolution dominated by sea level changes.

In the meander of Elbeuf, new sedimentological investigations were conducted on the Tourville and Elbeuf terraces, respectively at + 5 m and + 30 m relative height above the maximum incision of the valley bottom. Recently-discovered outcrop profiles exhibit mixed fluvial and tidal deposits that settled down during the Middle Pleistocene (0.12 – 0.78 ka BP). Results allowed us to describe a complete fluvial-tidal sequence characterized by a sedimentological change in fluvial architecture. The lower part of the vertical sequence show 5 to 15 m-thick fluvial deposits composed of coarse sands and gravels. Three types of fluvial styles were recognized on the basis of architectural element analysis and lithofacies distribution. The fluvial architecture corresponds to a gravel-bed braided river system which evolved toward a wandering gravel-bed system. These purely fluvial deposits are overlain by estuarine bodies (3 – 10 m) composed of sand and mud interbedding sequences. Then, the upper part evolves toward a slope context composed of reworked fluvial-tidal sands, local head deposits and loess-palaeosol successions. In summary, the fluvial-tidal sequence started by a gradient of high river discharges under periglacial conditions followed by the drowning of the Lower Seine valley during a marine incursion. Based on those field investigations but also numerical dating (IRSL and ESR/U-Th) and previous palaecological data, correlations were proposed between these fluvial-tidal records and the three major marine highstands at MIS 7, 9 and

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11. Those results have important applications to improve an original answering model of glacio-eustatism in the context of a coastal fluvial system.
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