Geophysical Research Abstracts
Vol. 16, EGU2014-16057, 2014
EGU General Assembly 2014
© Author(s) 2014. CC Attribution 3.0 License.

Dynamics of intertidal flats in the Loire estuary

Stephane Kervella (1), Aldo Sottolichio (2), and Christine Bertier (3)

(2) University of Bordeaux, EPOC Laboratory, France (a.sottolichio@epoc.u-bordeaux1.fr), (1) GEO-Transfert, University of Bordeaux, France, (3) GIP Loire Estuaire, France

Tidal flats form at the edges of many tidal estuaries, and are found in broad climatic regions. Their evolution plays a fundamental role in maintaining the morphodynamic equilibrium of an estuary. The Loire estuary is one of the largest macrotidal systems of the french atlantic coast. Since 200 years, its geometry has been drastically modified through channeling, deepening, embanking, infilling of secondary channels, etc. These works altered many intertidal areas. In the recent years, efforts for the rectification of the morphology have been made in order to restore the ecology of the estuary. In this context, it is crucial to better understand the dynamics of intertidal flats, still poorly understood in this estuary. The aim of this work is to analyse a series of original observations conducted for the first time in two intertidal flats of the central Lore estuary between 2008 and 2010. The tidal flats are situated in the northern bank, at 12 and 17 km upstream from the mouth respectively. Six Altus altimeters were deployed at two cross shore transects, measuring continuously and at a high-frequency bed altimetry and water level, providing information on tide and waves.

At the semi-diurnal tidal scale, the surficial sediment of intertidal flats is permanently mobilized. Altimetry variations are low, and their amplitude varies as a function of tides and river flow. At the scale of several months, the sedimentation is controlled by the position of the turbidity maximum (and therefore by the river flow) and also by the tidal amplitude. During low river flow periods, altimetry variations are only due to tidal cycles. During decaying tides, suspended sediment settle mainly on the lower part of the tidal flats, forming fluid mud layers of several cm thick, which can consolidate rapidly; under rising tides, the increasing of tidal currents promotes erosion. During periods of high river flow, the turbidity maximum shifts to the lower estuary. The higher suspended sediment concentration increases deposition and erosion rates, especially in the lower parts of the flats, where continuous sedimentary accretion is favoured by the proximity of the channel. During this period, reinforcement of current veolocities limits deposition in the central and high portion of the flats, where erosion is enhanced. The first rivers floods remove fluid mud in the upper estuary, previously deposited during the dry season, which is transported seawards. The transported suspended sediment settles massively in the lower parts of the flats and in the channels. The deposited mud is eroded a few days later.

These results provide useful information to better understand the dynamics of the Loire estuary, as well as they give in situ data to be compared with numerical modelling.