Geophysical Research Abstracts, Vol. 9, 09191, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09191

Analogue modelling of erosion-transport-deposition processes (coastal catchments to shoreface) in response to high-frequency sea-level and precipitation changes

O. Raynal, **F. Graveleau**, M. Séranne, S. Dominguez, F. Bouchette, J.E. Hurtrez,

1 Géosciences Montpellier, UMR 5243 - Université de Montpellier II-CNRS, cc 60, Place E. Bataillon, 34095 MONTPELLIER, France. (raynal@gm.univ-montp2.fr)

The relationships between the geomorphologic evolution of incised valleys, coastal system tracts and sea-level change are still an outstanding question. Laboratory experiments have been widely developed as a test for stratigraphic models and to analyse key variables such as sediment supply, base-level or subsidence. However, they seldom consider erosion in an experimental catchment as the sediment source for coastal deposition. In order to improve the understanding of the processes behind this "source-to-sink" concept, an experimental device was designed to observe the behaviour and evolution of erosion in coastal catchments, transport across the coastal plain, and deposition on the beach and shoreface, in response to successive cycles of sea-level and precipitation changes.

The apparatus, (2 x 1.45 m), is filled with water-saturated granular materials arranged as a monocline ramp with 6˚ slope. The lower part of the ramp – representing the sea – is covered with water whereas the upper part of the ramp – representing the continental catchment – is subjected to water microdroplet rainfall. Basement is kept stable. Two independent devices allow water-level variations and step by step rainfall changes. Runoff induces surface erosion, sediment transport in channels and deposition below

base level.

- In a first experiment, both sea-level and precipitation are kept constant. The evolution of the hydrologic network is characterized by spontaneous incision, terrasses formation and channel widening.
- During a second test, with constant rainfall and variable sea-level, cycles of incision/widening are strictly controlled by eustacy. The sea-level fall induces incision of the upstream drainage and of the coastal plain, as well as terrasses formation. During sea-level rise, upstream channels are widened by lateral bank erosion, providing continuous sedimentation to the margin. Terrasses formed during the previous stages of sea-level fall are therefore removed and the rate at which sea-level rises is determinant in the preservation of terrasses. Coastal tracts formed during these tests are in agreement with sequence stratigraphy.
- During a third test with constant sea-level and precipitation changes, both increase and decrease induce brutal incision and channel widening.

Our results show that the interference of autocyclic events (avulsions, spontaneous formation of alluvial terrasses), superimposed onto an allocyclic forcing (sea-level or precipitation) in the sedimentary record, can be addressed with analogue modelling. The upstream catchment displays imbricated terrasses, formed without tectonic forcing, eustatic or climate change. Erosion does not switch off during sea-level rise, as widening of the channels by bank erosion provides further sediment to the margin. There is not a simple link between terrasses formation and allocyclic forcings, thus alluvial terrasses should be used with caution to study the forcings.