Flume experiments on the effect of sea level change to the channel developing processes

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Although it is a widely accepted idea that sea level change causes the change of the base level for rivers on lands that is a major factor determining the longitudinal profile of rivers, a theory for detail prediction of the response from sea level change to rivers is still developing. To obtain deeper understanding of the response of sea level change, here we conducted experiments using a seepage-type flume (90 cm wide, 180 cm long and 25 cm deep) in order to minimize the flow discharge, and well-sorted sand of 0.2 mm in the mean diameter. We performed two types of experiments, lowering and rising sea levels with several rates using a water level controller, while the initial gradient of the watershed slope was constant (10 degree) in all runs.

In lowering sea level experiments, we observed those below: (1) some channels extended obliquely to the coastline, the flow direction being constrained by deposits at the mouth caused by continuous fall of sea level, although these channels were often swept away by following lateral migrations. (2) New channels appeared and incised upstream from the midstream of the obliquely extended channels. (3) Most of nick points caused by the fall of sea level stopped in the midstream especially at meandering channels, in contrast to Akiyama and Muto (2006) using a 1D flume showing that the response propagated to the upstream end of the alluvial area. The range of response observed in our experiments, however, is wider than as reported form experiments supplying water by artificial rainfall conducted by Koss et al. (1994) stating that the effect of sea level fall was limited near the coast. In rising sea level experiments, we observed that (4) 'bunchy' sedimentary landforms were formed near the river mouth. (5) In the coastal areas, lateral migration of channels became actively. In both experiments of lowering and rising of sea level, it seems that there is no correlation between the rates of valley head erosion and rates of sea-level change.