Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08995, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08995
EGU General Assembly 2008

Combining sandbox and numerical experiments to study the influence of relay ramps on sedimentation in rift basins

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In rift basins (e.g. the deep-marine Vøring Basin offshore Norway) the depositional architecture of submarine fans is strongly constrained by the topography of the slope and the basin floor. Particularly interesting features in such settings are relay ramps, forming between overstepping extensional faults, because they may redirect the pathways of turbidity currents into the basin. The mutual interplay between rift margin development and basin infill has thus an important influence on the resulting architecture and hence the location, shape and stacking patterns of submarine fans.

In this study a combination of physical scale experiments in sandboxes and numerical experiments is performed to investigate the influence of relay ramps on submarine fan architecture. In an experimental set-up of 44 x 62 cm a two-layer model is constructed with a 4 cm thick sand sequence above a 0.5 cm thick silicone layer that acts as a ductile detachment layer. Extension is achieved by pulling part of the base away from the rest, whereby the exact geometry of this base-split controls the development of the rift system. When a relay ramp develops the topography is photographed and laser-scanned, and the resulting digital elevation model is used as input for the numerical flow calculations. The turbidity currents are then numerically modelled using a variety of flow parameters, and the resulting deposits are physically added to the sandbox model. The extension is then allowed to continue, and at regular time steps the procedure is repeated, therefore simulating syn-tectonic sedimentation. After the

experiment serial cuts are made in order to analyse the resulting layer geometries.