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Salt tectonics in an experimental turbiditic tank

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We modelled the effect of the deposition of clastic sediments wedges along passive margin by combining two different experimental approaches. The first approach, which uses flume experiments in order to model turbiditic transport and deposition, had focused, so far mainly on the stratigraphic architecture and flow properties. But most experiments have not accounted for the impact of syndepositional deformation.
The second approach is the classic tectonic modelling (sand-box experiments) is aimed essentially at understanding deformation, for example the deformation of a sediment wedge deposited onto a mobile salt layer. However, with this approach, the sediment transport processes are crudely modelled by adding each sediment layer uniformly, regardless of the potential influence of the sea-floor bathymetry on the depositional pattern.
We designed a new tectono-stratigraphic modelling tank, which combines modelling of the turbiditic transport and deposition, and salt-related deformation driven by sediment loading. The set-up comprises a channel connected to a main water tank. A deformation box is placed at the mouth of the channel, on the base of the tank. The base of the box can be filled with various kinds of substrates either rigid (sand) or viscous (silicone polymer, simulating mobile salt layer having varying length and thickness). A mixture of fine-grained powder and water is maintained in suspension in a container, and then released and channelled toward the basin, generating an analogue of basin-floor fans or lobes.
We investigated the effect of depositing several consecutive turbiditic lobes on the deformation of the salt body and its overburden. The dynamics of experimental turbidity currents lead to deposits whose thickness varied gradually laterally: the lobe is thick in the proximal region and thins progressively distally, thus creating a very gentle regional surface slope. As the fan grows by episodic deposition of successive turbiditic lobes, the model deforms spontaneously by vertical collapse and lateral spreading of the entire overburden.
We conducted a series of systematic experiments varying the length and thickness of the salt body, as well as the sediment input and nature.