



Brittle viscous coupling in extension, insights from analogue modelling

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Continental lithosphere extension occurs in various plate tectonic environments leading to localised rifting when the brittle crust has a normal thickness and widespread extension where the brittle crust is thicker.

Thin skinned extension occurs on most of the passive margins and result from the gliding of a brittle sedimentary cover of variable thickness over a ductile decollement layer.

If the strength of a brittle layer is directly depending of its thickness, the strength of the ductile layer, for a given thickness, depends on the strain rate.

We present here a selection of laboratory experiments on small-scale models made of sand and silicone putties to simulate the frictional and viscous behaviour of the crust (or overburden) and the mantle (or decollement layer) respectively, designed to study the effects of the coupling existing between brittle and ductile layers in extensional regime.

Different thickness of the brittle layer and different strain rates are used. Synkinematic layers are deposited during the experiments to simulate sedimentation.

We demonstrate that:

- (i) the variation in coupling between brittle and ductile layer can reproduce, and explain, the whole range of extensional structures
- (ii) localised extension results from weak brittle ductile coupling, i.e., strong brittle

strength and/or low ductile strength,

(iii) transitions from horst and graben to tilted blocks result from an increase in ductile strength, i.e. high viscosity and/or high strain rate.