Indenter geometry and erosional control of thrust patterns in orogens

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Indentation of the brittle upper crust by a cooler and stronger plate extrudes an orogenic wedge between suites of coupled fore- and back-thrusts. Orogens control climate and therefore erosion rates. Erosion rates in turn control the development of thrust patterns in orogens. Analogue sand models were used to explore the effects on the extrusion geometry of syn shortening *erosion* with local *redeposition* (=redistribution).

Rigid indenters representing strong continental crust with frontal dips ranging from 15° to 75° were driven into sand layers representing hangingwalls of brittle crust.

For models without erosion and a rigid indenter face close to the internal friction angle of the material (~30°), the rigid indenter acts as the active back-thrust. When the rigid face is > 45° or ≤ 15° an *effective indenter* with a front face dipping at ~30° accretes in front of the rigid indenter.

The geometry of the rigid indenter controls the number of fore-thrusts that develop. Models building effective indenters are less efficient in building fore-thrusts as they partition strain by compaction of the extra volume of sand incorporated in the effective indenter.

Erosion and redeposition of the rising orogenic wedge changes its geometry and rate of development. Erosion decreases vertical loading above the rising wedge while deposition loads the margins. As a result, fewer thrusts remain active for longer periods. Moderate redistribution narrows and steepens surface structures without the development of an effective indenter while an internally deforming effective indenter develops during limited erosion.