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Analogue models of multi-layer brittle ductile wedges, and comparison with natural examples

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The dynamic of orogenic wedges detached over a ductile decollement level has been studied by the means of analogue modeling. 2D Multi-layer sand/silicon wedges are shortened at variable velocities and imaged by X-ray tomography to obtain 4D scenarii of tectonic evolution. To enlarge the range of the studied modeling parameters (decollement strength, velocity, rheological layering), we developed the use of sand-loaded silicons with calibrated viscosities. The model database is composed of more than 60 experiments. The first order data from the experiment are the prism geometry as well as its structural style (detailed as fish-tail, pop-up, asymmetric folding and in-sequence thrusting), and its propagation history. The models show that the overall geometry of the prism is entirely controlled by the decollement properties, whereas the structural style is controlled jointly by the decollement properties and by the rheological layering. The observed trends between the models mechanical boundary conditions and the observed structural styles are affected by the rheological layering and vertical strength profile, and modulated by the maturity of the prism. Similar first order data from natural examples of orogenic prims detached over a salt layer have been collected, and display a very similar pattern. The influence of parameters such the belt maturity, erosion and sedimentation are also discussed.