Geophysical Research Abstracts
Vol. 12, EGU2010-11709-2, 2010
EGU General Assembly 2010


# Quantitative comparisons of analogue models of brittle wedge dynamics

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Analogue model experiments are widely used to gain insights into the evolution of geological structures. In this study, we present a direct comparison of experimental results of 14 analogue modelling laboratories using prescribed set-ups. A quantitative analysis of the results will document the variability among models and will allow an appraisal of reproducibility and limits of interpretation. This has direct implications for comparisons between structures in analogue models and natural field examples. All laboratories used the same frictional analogue materials (quartz and corundum sand) and prescribed model-building techniques (sieving and levelling). Although each laboratory used its own experimental apparatus, the same type of self-adhesive foil was used to cover the base and all the walls of the experimental apparatus in order to guarantee identical boundary conditions (i.e. identical shear stresses at the base and walls). Three experimental set-ups using only brittle frictional materials were examined. In each of the three set-ups the model was shortened by a vertical wall, which moved with respect to the fixed base and the three remaining sidewalls. The minimum width of the model (dimension parallel to mobile wall) was also prescribed.

In the first experimental set-up, a quartz sand wedge with a surface slope of $\sim$20° was pushed by a mobile wall. All models conformed to the critical taper theory, maintained a stable surface slope and did not show internal deformation. In the next two experimental set-ups, a horizontal sand pack consisting of alternating quartz sand and corundum sand layers was shortened from one side by the mobile wall. In one of the set-ups a thin rigid sheet covered part of the model base and was attached to the mobile wall (i.e. a basal velocity discontinuity distant from the mobile wall). In the other set-up a basal rigid sheet was absent and the basal velocity discontinuity was located at the mobile wall. In both types of experiments, models accommodated initial shortening by a forward- and a backward-verging thrust. Further shortening was taken up by in-sequence formation of forward-verging thrusts. In all experiments, boundary stresses created significant drag of structures along the sidewalls. We therefore compared the surface slope and the location, dip angle and spacing of thrusts in sections through the central part of the model.

All models show very similar cross-sectional evolutions demonstrating reproducibility of first-order experimental observations. Nevertheless, there are significant along-strike variations of structures in map view highlighting the limits of interpretations of analogue model results. These variations may be related to the human factor, differences in model width and/or differences in laboratory temperature and especially humidity affecting the mechanical properties of the granular materials.

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