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Propagation of an inherited strike-slip fault through an undeformed cover: quantitative aspects from analogue modeling and applications.

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The propagation of a reactivated strike-slip fault through an undeformed cover may occur in various tectonic settings, where the cover can be formed by different sedimentary and/or tectonic elements. We prepared five simplified analogue models (using two different granular materials, sand and glass microbeads) to reproduce the state of deformation of areas where inherited lineaments affecting the foreland influence the overlapping orogenic wedge and the chain when reactivated. The experimental apparatus was provided with a baseplate fault, which extended for the whole length of the models and accommodated a right-lateral simple shear. The foreland-side of the models has a vertical discontinuity perpendicular to the wedge front, obtained through a cut that reorganizes the grain distribution and creates a preferential slip surface. We placed special emphasis on quantifying the structural features observed in the models to interpret the kinematics of the reactivated lineament, investigating how strike-slip along a pre-existing zone of weakness propagates toward the surface and affects the cover and characterizing the propagation of deformation from the inherited structure as a function of displacement. The interpretation was based on a joint analysis of surface and subsurface data taken from the models. We carried out a quantitative analysis of the displacement along the different surficial faults of the experiments by measuring systematically the displacement values during and at the end of deformation and comparing them with the displacement applied on the baseplate fault. This analysis

has been performed on the three domains of the experiment, the foreland, entirely affected by the pre-existing cut, the wedge, partially affected by the inherited lineament and the chain where only the base plate faults acts. The results highlight how strongly the modeled geological setting is influenced by the presence of a reactivated pre-existing lineament, that appears to control the development and pattern of newly-formed faults. A difference between imposed and measured displacements, in fact, can be observed only in the domains where no pre-existing lineaments are present. In the foreland domain the pre-existing fault acts as a preferential slip surface accommodating almost all the displacement so that no new faults are formed. The three domains also differ for the number of faults: only the pre-existing fault in the foreland, few faults in the wedge, more faults in the chain. Finally, faults with strike comparable to the baseplate fault take up a larger displacement and remain active for a longer time; faults with deviating strikes are active for a shorter time and their displacement is smaller.