Geophysical Research Abstracts
Vol. 19, EGU2017-11838, 2017
EGU General Assembly 2017

The role of pre-existing thrust ramps on the evolution of a differently oriented thrust systems

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In the accretionary wedges, as well as in fold-and-thrust belts, shortening is mostly accommodated by fault-related folding. This kind of structures are sensitive both to internal factors such as the mechanical characteristics of the rocks involved in contractional processes, and to external ones such as erosion or syn-kinematics sedimentation. Notwithstanding such diversity, the resulting geometries are commonly composed by faults with flat and ramp trajectory and their related folds. The above mentioned factors may directly affect both the geometry and the kinematics of a fault-related folding, for instance, the location, the number, and the frictional properties of weak horizons lead the location and the extent of the flat portion of the thrust systems. The mechanical properties of the rocks involved in the contractional phase impacts on the location and geometry of the thrust ramp. Thus, the stratigraphic and tectonic architecture of an area is central to predict or study the evolution of a contractional system. Among different factors, we select to test the role of pre-existing thrust ramp on the subsequent evolution on differently oriented thrust ramp. As a method we use analogue modeling and as an analogue material we use wet clay (kaolin). We reproduce different setups varying the initial orientation of the pre-existing thrust ramp with respect to the new ramp that we force to nucleate in the same region of the experiment box. The tested angles vary from 0°, i.e. the two ramps are parallel, to 90°, i.e. the two ramps are perpendicular. Our results show that the angle between the two systems directly impact on the degree of development of new ramps. When the angle between new and pre-existing thrust ramps is low, e.g. <30°, the reactivation of the pre-existing ramp prevail on the development of a new ramp. Conversely, high angles promote the development of new thrust ramps optimally oriented with respect to the imposed stress field. Our results are finally compared to a natural case located in South-Eastern Alps where the Dinaric thrust ramps have a different orientation with respect the younger alpine thrusts. Also in this natural case we observe a direct relationship between the angle of the two, diacronous thrusts system on the tendency to reactive the older structure or to produce new structures optimally oriented with respect to the younger stress field.