Geophysical Research Abstracts
Vol. 15, EGU2013-4750, 2013
EGU General Assembly 2013

Normal faulting during overall compressive events in accretionary wedges

Nadaya Cubas (1), Adeline Pons (2), Pauline Souloumiac (3), and Yves M. Leroy (2)

(1) California Institute of Technology, Tectonics Observatory, Division Geological and Planetary Sciences, Pasadena, CA, USA, (2) Ecole Normale Supérieure, Laboratoire de Géologie, Paris, France, (3) Département Géosciences et Environnement, Université de Cergy-Pontoise, France.

Observations following the Tohoku-Oki earthquake suggested the concurrent activation of normal faulting at the rear and of reverse faulting at the toe of the wedge (Ito et al., 2011). The objective of this talk is to justify these observations with a mechanical analysis.

The prototype considered consists of the triangular wedge with the decollement partionned into two regions, the external and the internal regions corresponding to the seismic and the aseimic regions,respectively. Different pressure ratios and friction angles are assigned to these two regions of the decollement. Pons and Leroy (2012) applied the maximum strength theorem extended to porous rocks to this prototype to obtain the most likely collapse mechanism during an overall compression from the rear. They show semi-analytically that this collapse mechanism could indeed be composed of the complete activation of the decollement with the wedge partionned by a steeply dipping fault rooting at the transition between the two regions of the decollement. This fault is normal or reverse and is dipping towards the front or the rear depending on the two pressure ratios within the decollement and the friction angles. If the fault is normal, the frontal region is gliding on the decollement faster than the rear region over the seimic region and could lead to thrusting at the wedge toe. The proposed methodology will be presented in details as well as the parametric study leading to these conclusions, complemented by numerical results based on the same theory but with effective friction angles, prior to the discussion of field applications.