Geophysical Research Abstracts
Vol. 13, EGU2011-7465, 2011
EGU General Assembly 2011

Fold boudins: what is that?

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The hypothesis proposed in this work is related with the genesis and evolution, in HT simple shear zones, of a new conceptual structure designed by fold boudin. The field evidences, achieved in the scope of a methodology to analyze the kinematics of shearband boudins (Pamplona & Rodrigues, 2011), are the basis to show how folds evolute until reach a shearband boudin final state. The critical mass factor (Mc) is the responsible for that mechanism. This parameter, which is now being introduced, is controlled by the thickness (t).

The systematic analyses of shearband boudins geometry point to the hypothesis that the development of this structure is precluded by a folding phase, according to the following path evolution in HT shear zones shearband boudins: fold => fold boudin => shearband boudin.

In this particular case, which is the aim of this communication, the evolution departs from a thin layer and ends in the classical shearband boudin geometry, showing unexpected internal anisotropies that we interpret as the final state of flattening process of the inherited folding structures.

The process begins in the classical folding domain, where the first structures that occur are asymmetrical folds (z-folds and s-folds) with axial planes oriented on the quadrant of c' type-II (a specific set of secondary shear planes), but with a higher angle relatively to the bulk shear plane. This angle works like a maximum asymptotic value for c' type-II. This structure has the geometrical characteristics of ptigmatic asymmetrical folds, but disposed with a low angle relatively to the layering.

The process follows with increasing bulk strain, where c' type-II nucleates controlled by axial surfaces of some asymmetrical folds, giving rise to segmented z- or s-fold veins displaced by this set of secondary shear planes. The folds maintain the inherited geometry but are slightly flattened and rotated synchronous with the bulk shear sense.

The deformation goes on with the continuous flattening of folded package, rather than the developing of new shear structures, developing a false sigma feature here designed fold boudin. This foldtrain exhibits an apparently antithetic kinematics relatively to shear zone given by its external morphology. The key structure to an appropriate kinematic interpretation is the internal asymmetrical folds kinematic criteria. This is a similar phenomenon to that described in the experimental work of Bons (1993) when, after the folds tighten, the foldtrain starts to behave as one single unit that rotates due to the vorticity of flow.

An alternative way to reach this evolutional level happens when the inhibition of shear rupture predominates, which results on the developing of a localized central folding on the vein, generating a fold boudin with two longs and narrow opposite tails.

As a consequence of this evolutionary process, an initial folded narrow vein generates a thick compact, side parallel, tighten body designed here by stacked fold boudin. In this phase, when stacked folds boudins are fully developed, this geologic body acquired the critical mass (Mc) that makes it possible to trigger the development of a shearband boudin.

In conclusion the evolution of the thin bodies holds up the folding until it culminates with the coalescence and stacking of the folds. By this mechanism a critical mass is reached and it begins a new phase of classical boudinage. All tabular bodies embed in a ductile matrix, subject to a shearband boudinage process, converges to classical shearband boudin morphology.

References

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