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Erratum

Lecomte, E., Le Pourhiet, L., Lacombe, O. & Jolivet, L., 2011. A continuum mechanics approach to quantify brittle strain on weak faults: application to the extensional reactivation of shallow dipping discontinuities (*Geophys. J. Int.,* **184,** 1–11).

Recently, a mistake has been discovered in Lecomte *et al.* (2011), in the equation to calculate the orientation of the maximum principal stresses within the shear zone in a steady state. Thus, some statements in the text and fig. 6 illustrating the orientation of the maximum principal stresses and the secondary shear bands are affected by this mistake and are corrected here. In the following, we list parts of the text which needed to be changed (changes given in bold). In fig. 6, the associated plastic flow case and compaction case are inverted. Fig. 6 is amended herein and fully replaces the original fig. 6.

CHANGES IN TEXT

Section 3.3 Predicted stress rotation versus tectonic markers in natural fault zones (p.8 of Lecomte *et al.* 2011)

As the plastic dilation angle ψ is much smaller than the friction angle φ in most of the natural cases, our model predicts that slip on faults will affect the orientation of the principal stress axes within the fault zone and perhaps also the slip lines within the shear zones. Elasto-plastic behaviour of faults can easily be defined by field observations (striated fault plane, brecciated gouge…). However, few direct field evidence may support the compacting nature of fault zones. The stress rotation predicted by our model can nevertheless be tested through the examination of micro/mesostructures observed in natural fault zones, such as subsidiary shears like Riedel shears, among others. Fig. 6 shows the orientations of the internal shear structures (α- and β-shear bands) that should form in the shear zone as it slips in the steady state regime, for three characteristic values of dilation ($\psi = -\varphi$, $\psi = 0$, and $\psi = \varphi$). In the incompressible case ($\psi = 0$), we see that α- and β-shear band correspond to the R–R’ conjugate system of Riedel shear (Fig. 6) as Byerlee suggested in 1992. In the **dilating** shear band case ($\psi = \varphi$), the internal shear structure α is parallel to the shear zone and may correspond to the Y-band orientation that appears in mature fault zones (Tchalenko 1970). In a general case, the maximum

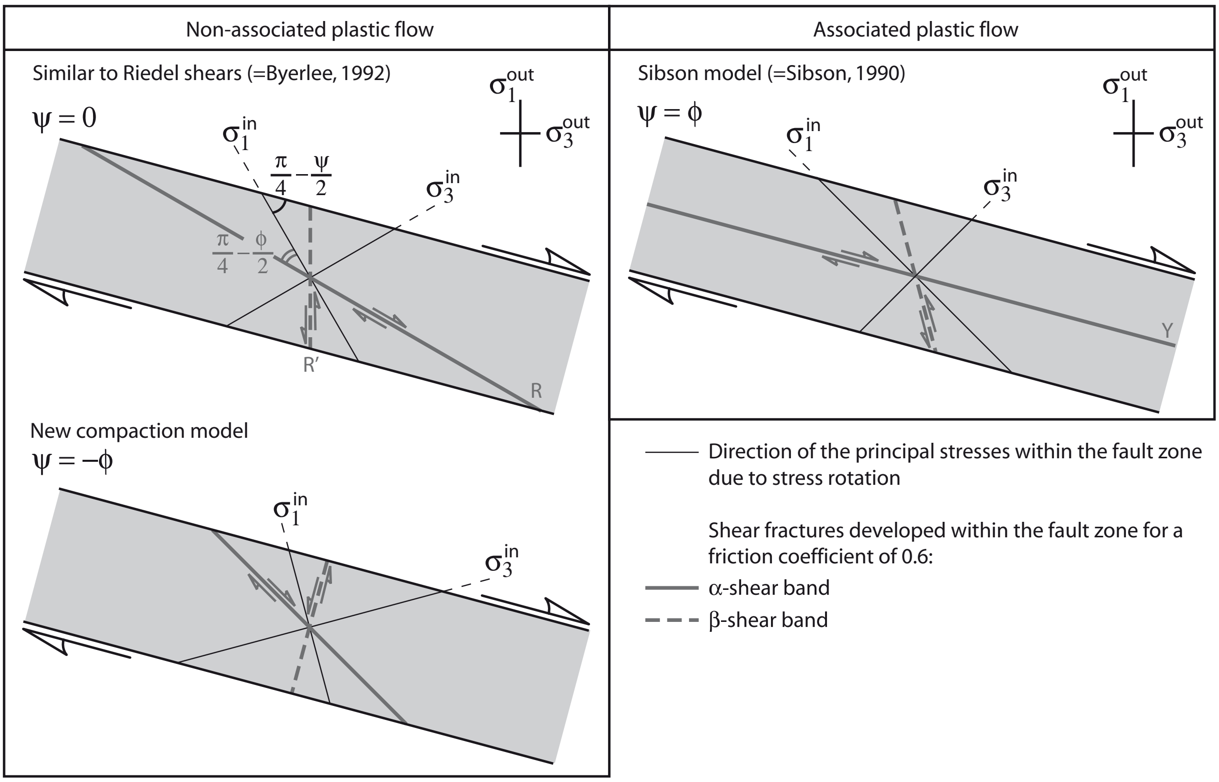

Figure 6. Predicted newly formed micro/meso-structures after the stress rotation within the fault zone for the three characteristic dilation angles ($\psi = -\varphi$, $\psi = 0$, and $\psi = \varphi$). For $\psi = 0$, α- and β-shear band correspond to R–R’ Riedel shears. In the dilating shear band case ($\psi = \varphi$), the α-shear band is parallel to the shear zone margin and may correspond to the Y-band orientation.

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principal stress makes an angle of **$\pi/4-\psi/2$** with the shear zone and the internal shears α and β make an angle of $\pi/4-\varphi/2$ with the direction of the maximum principal stress (Fig. 6). We therefore argue that accurate characterization of the orientation of subsidiary shear planes within a natural fault zone may allow to discriminate between the various possible mechanical behaviours predicted by our modelling. In particular, the occurrence of Y-bands would provide evidence for large-scale **dilation** of the frictional shear zone, **the occurrence of antithetic shear bands being only possible in the case of large-scale compaction of the shear zone.**

Stress rotation within the fault zone has also been explained by invoking a decrease of the elastic compressibility towards the fault (e.g. Faulkner *et al.* 2006). Interestingly, both the model proposed by Faulkner *et al.* (2006) and our **incompressible and dilating** model suggest a rotation of the maximum principal stress to an angle favourable to nucleate well-oriented faults within the fault core. Whilst the two models are conceptually very different, they reach very similar predictions in term of stress orientation. In Faulkner *et al.* model (2006), the stress rotation is due to elastic strain within the shear zone prior to yielding. With that model, the fault gouge is well oriented and plastic yielding is predicted to onset in a strain-softening (i.e. unstable) regime at the scale of the fault zone.

In our model, the direction of the principal stresses rotates with plastic yielding in a hardening regime and it is only after a complete rotation that the small patches, as Riedel shears, may form in softening regime within the shear zone. In the case of a **dilating** fault, the patch may even be parallel to the fault zone. The apparent similarity of the behaviour of the two models relies on the fact that our elasto-plastic rigidity matrix has the same form as the anisotropic elastic rigidity matrix (e.g. Healy 2009).

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