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Stress orientation evaluation from mechanical characterization of fault gouge

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Within the frame of the 'CRL' (Corinth Rift Laboratory project) (Cornet et al, 2004a) centered on the south western sector of the Gulf of Corinth (http://www.corinth-rift-lab.org), fault zone cores from the active Aigion fault have been collected continuously from depths between 708 m to 782 m. As part of the project, our work was focused on the thermo-poro-mechanical characterization of fault gouge from the Aigion well.

In a previous recent paper results from mechanical laboratory analyses on specimens taken from the Aigion fault core have been presented (Sulem et al, 2004). Special attention has been paid on temperature effects on the behavior of the clayey core extracted at 760m. Inside this clayey core, a clear shearing surface with marked slip lines is visible on a plane that makes a 68° angle with respect to the core axis. This failure surface was not induced by the decompression process but is indeed a slip plane as clear striation is observed at the interface. On the basis of an elastoplastic constitutive model calibrated on triaxial tests on the clayey gouge, it is shown that shear band formation inside the clayey core is possible. The solution for the orientation of the shear band is compared to the orientation of an existing slip surface inside the clayey gouge and this result is used to deduce the orientation of the principal stresses. It is shown that as commonly observed in weak fault zones, the orientation of the principal stresses is locally almost parallel and perpendicular to the fault axis.

References

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