EFFECT OF MELT SURFACE TENSION ON THE BEHAVIOUR AND MORPHOLOGY OF FAULT GOUGE

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Field evidence, laboratory experiments and theoretical predictions suggest that the formation of frictional melt within a layer of gouge separating fault surfaces is a regular occurrence during coseismic slip. The melt which may be localised or widespread, contributes to both slip-weakening and restrengthening processes through a range of physical phenomena. In particular we contend that melt surface tension and its interaction with other fault processes is a critical determinant of gouge coseismic mechanical response and morphology. We extend the model of Gan et al. [1] to include the effects of surface tension for a small segment of gouge by considering the formation of melt liquid bridges between partially molten particles at low melt volume fractions. We introduce additional inter-granular forces to account for this phenomenon based on the framework of Soulié et al [2] extended by Gan et al. [3]. We find that gouge apparent friction and particle size and shape are highly sensitive to changes in melt surface tension for a wide range of seismic shear regimes.

References

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