



Fault maturity and geodetic interpretations: how the 'spin up' cycle affects the interpretation of lithospheric viscosity and fault slip deficit

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The use of geodetic measurements in the post- and inter- seismic period is an important tool to evaluate fault strain accumulation (slip deficit) and rheological properties of the lithosphere. However, the geodetic measurements themselves are only telling us the movement (or relative movement) of selected points and therefore are not a direct measurement of the parameters we seek to constrain. To derive the values of those parameters, we introduce assumptions on the behaviour and the properties of the lithosphere surrounding the fault and apply them in models.

Two of these assumptions are that the fault is in a relative steady state (often referred to as mature state) where the observed interseismic period is independent of the previous history, or that the surrounding material has not been previously stressed. In reality, the fault would take different earthquake cycles to reach maturity. Here we use a FEM code to analyse the effect of the spin up cycle on our interpretation of geodetic data for faults that are not in a fully mature state and the effects of the loading system (boundary conditions) on the spin up cycle. In particular we observe that when the fault is not in the mature state our interpretation of the viscosity of the lithosphere can be significantly lower than the "real" one.