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Strain accumulation across the Aksay segment of Altyn Tagh fault: Investigation of the influence of laterally varying lithospheric properties and a low-viscosity channel

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We use boundary element methods to develop earthquake cycle models consisting of faulting in an elastic plate with possibly different thickness and rigidity on either side of the fault overlying a viscoelastic substrate. We show that isolate plate models that neglect the coupling of the plate to the underlying substrate might significantly overpredict the asymmetry in deformation across the fault. We also show a low-viscosity channel that exists within lower crust could significantly contribute to the asymmetry. We investigate the segment of Altyn Tagh fault, the northern border of the Tibetan plateau between the Tarim and the Qaidam basins, where surface velocity (projected to fault-parallel direction) obtained from a stack of 15 interferograms using ERS and ENVISAT radar data covering the 1995–2006 period is distinctly asymmetric. We examine the possibility of the existence of low-viscosity lower crust (a channel) in the Tibetan plateau which has been debated. We find that the asymmetric pattern of strain accumulation are attributed mainly stiffness contrast (stiffer Tarim) and partially thickness contrast (thicker Tarim) and the existence of low-viscosity lower crust (a channel) in the Tibetan plateau is likely; however, the viscosity of this mid-crustal Tibetan channel in not resolvable.