

## **Postseismic deformation in Pakistan after the 8 October 2005 earthquake: Evidence of afterslip along a flat north of the Balakot-Bagh thrust**

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[1] The 8 October 2005 Kashmir earthquake ruptured an out-of-sequence Himalayan thrust known as the Balakot-Bagh thrust. The earthquake's hypocenter was located at a depth of 15 km on the ramp close to a possible ramp/flat transition. In the weeks following the earthquake a GPS network was installed to measure postseismic displacement. The initial measurements in November 2005 were followed by other campaigns in January and August 2006, in March and December 2007, and in August 2008 and 2009. Two hypotheses were tested: post-seismic displacements controlled by viscous relaxation of the lower crust or by afterslip along a flat north of the ramp affected by the main shock. A single Newtonian viscosity for the different periods cannot be determined by numerical simulations of viscous relaxation, which may indicate that the viscosity of the lower crust is non-Newtonian or that viscous relaxation does not control postseismic displacements. Numerical simulations using dislocations in a uniform elastic half-space indicate afterslip north of the ramp of the earthquake along a flat connected to the ramp. Slip along the northwestern portion of the flat accrued to about 285 mm between November 2005 and August 2006, while slip along the southeastern portion accrued to 130 mm over the same time period. Residual misfit of the observed and predicted displacements clearly indicated that afterslip is a better explanation for the observations than the hypothesis of viscous relaxation. The time evolution of the afterslip was found to be consistent with that predicted from rate-strengthening frictional sliding.

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