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The 05/10/2008 Mw 6.7 Nura earthquake sequence on the Main Pamir Thrust

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Ongoing collision between the northwestern corner of the Indian indenter and Eurasia forms the Pamir mountains in Central Asia. High differential GPS velocities of approx. 13 mm/a across Pamir's northern perimeter, between the Trans Alai mountain front and the intramontane Alai valley suggest that about one third of current India - Eurasia convergence is accommodated along the south-dipping Main Pamir Thrust fault (MPT) that is separating the two. On October 5th, 2008 an earthquake of Mw 6.7 destroyed the Kyrgyz town of Nura, close to the border to both China and Tajikistan causing at least 70 fatalities. The earthquake occurred at MPT's northwesternmost tangent point, where the Alai valley closes and the Pamir collides with the Tien Shan. This is a region of significant structural complexity, where the MPT fans out in a series of northeast trending orographic features before it continues further south to bound the Tarim basin. This is also a region of high seismic activity: The 1974 Markansu earthquake of similar size might have occurred on the same structure.
The Nura event was exceptionally well recorded by the temporary Tien Shan Pamir Geodynamic Programme (TIPAGE) seismic network. One TIPAGE station was located in the town of Nura in immediate vicinity of the epicenter. A profile of 24 stations from Osh in Kyrgyzstan to Zorkul in Tajikistan covered the western half of the focal sphere. After about two weeks following the mainshock seven additional seismic stations were added in the Alai valley by a German-Kyrgyz earthquake Task Force and two more instruments by the Earthquake Administration of Xinjiang Uygur Autonomous Region on the Chinese side. The mainshock shows an almost pure thrust mechanism with one steeper (55°) and one more shallow (38°) dipping nodal plane. We relocated 326 aftershocks with Ml>3.0 using manually picked arrival times and cross correlation based differential times and the Double Difference algorithm. The resulting seismicity shows two lineaments forming a hockey stick like feature that tightly follows the orographic relief. The "blade" strikes approximately 85° in agreement with one nodal plane of the mainshock double couple. A cross section through the aftershocks reveals that the steeper, south-dipping nodal plane is the fault plane. Aftershocks are confined to the uppermost 10 km of the crust. The "shaft" strikes approximately NNE and several of the aftershocks exhibit left-lateral strike-slip mechanisms with one nodal plane matching this trend. Coulomb stress modeling of the presumed mainshock rupture indicates that such secondary faulting would be promoted by the main event.