



Kinematics of the Pamir and Hindu Kush regions from GPS geodesy

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GPS velocities measured in the Pamir and surrounding regions show a total of ~ 25 mm/yr of northward relative motion between stable Pakistan and Eurasia. The convergence budget is partitioned into 10-15 mm/yr of localized shortening across the Trans-Alai Thrust, which bounds the Pamir on the north, where southward subduction of intact lithosphere seems to occur. Another 10-15 mm/yr of shortening is distributed across the Chitral Himalaya and Hindu Kush, suggesting that Hindu Kush seismicity might be related to subduction of Indian lithosphere. Modest shortening at < 5 mm/yr occurs north of the Trans-Alai Thrust, across the South Tien Shan and between the Ferghana Valley and Eurasia. As much as 5 mm/yr, and perhaps 10 mm/yr, of east-west extension occurs within the Pamir, and is matched by a comparable amount of east-west shortening in the Tajik Depression. The localization of shortening to the margins of the Pamir combined with observations of distributed internal extension implies that the east-west vertically averaged, horizontal compressive normal stress is smaller than the north-south compressive perhaps because material from the elevated Pamir is free to move into the low-elevation Tajik Depression and Tarim Basin.