Characterizing Crustal Deformation in the North Tien Shan Using Geodetic and KNET Seismic Data

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In an ongoing collaborative effort between San Diego State University and the Institute of High temperature Physics in Bishkek, Kyrgyzstan (IFTRAN), we investigate ground deformation in the North Tien Shan Mountains of Central Asia using a combination of interferometric synthetic aperture radar (InSAR), Global Positioning System (GPS), and seismic data from the Kyrgyzstan seismic network (KNET). The goals are to measure a range of deformation including continuous tectonic crustal deformation, episodic events associated with earthquakes, and ongoing slope failure events. By combining this data with seismicity maps from the KNET seismic catalog we identify areas of high strain with high spatial and temporal resolution. Identification of areas of high strain will be important for both scientific study of thrust movements and earthquake hazard mitigation. We are also working on identifying and modeling specific earthquakes with both InSAR data and KNET waveform data using method developed on Southern California data (e.g. Mellors et al., 2004).

Figure 1. Images of the interferometric phase (top), radar amplitude (middle), and topography (bottom) centered on the city of Bishkek, Kyrgyzstan (bright area on amplitude image). The yellow dots are earthquakes and quarry blasts recorded by the KNET seismic network from 1992 to 1998. Red triangles denote KNET stations and the red line on the bottom (topography) image represents the radar scene boundaries. Color changes on the phase image represent variations in line-of-sight phase change as measured between two radar images taken in 1999. Due to the short time span, much of the visible phase change may be due to atmospheric effects in this specific image.

Figure 2. Optical satellite image of Northern Tien Shan draped over digital elevation model with background seismicity as recorded by KNET marked by yellow dots and historical large earthquake marked by red dots.


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