



Morphotectonic mapping from the analysis of automatically extracted lineaments using Landsat 8 images and SRTM data in the Hindukush-Pamir

Mehdi Rahnama (1,2) and Richard Gloaguen (1,2)

(1) Remote Sensing Group, Institute of Geology, TU Bergakademie Freiberg (TUBAF), Bernhard-von-Cotta-Str. 2, 09599, Freiberg (Sachsen), Germany (meh.rahnama@gmail.com), (2) Remote Sensing Group, Helmholtz Institute Freiberg of Resource Technology, Halsbruecker Str. 34, 09599, Freiberg (Sachsen), Germany

Modern deformation, fault movements, and induced earthquakes in the Hindukush-Pamir region are driven by the collision between the northward-moving Indian subcontinent and Eurasia. We investigated neotectonic activity and generated tectonic maps of this area. We developed a Matlab based toolbox for the automatic extraction of image discontinuities. The approach consists of frequency domain filtering, edge detection in the spatial domain, Hough transformation, segment grouping, polynomial interpolation and geostatistical analysis of the lineaments patterns. Statistical quantification of counts, lengths, azimuth frequency, density distribution, and orientations are analyzed to understand the tectonic activities, to explain the prominent structural trends, and to demarcate the contribution of different faulting styles. Morphotectonic lineaments observed on the study area were automatically extracted from panchromatic band of Landsat 8 with 15-m resolution and SRTM digital elevation model (DEM) with 90-m resolution. Then, this data was analyzed to characterize the tectonic trends that dominated the geologic evolution of this area. We show that the SW-Pamir is mainly controlled by the Chaman-Herat-Central Badakhshan fault systems and, to a lesser extent by the Darvaz fault zone.

Extracted lineaments and the intensity of the characterized tectonic trends correspond well with reference data. In Addition, results are consistent with the styles of faulting determined from focal mechanisms of the historical earthquake epicenters in the region. The presented results could be applicable in different geological aspects that are based on a good knowledge of the system patterns and the spatial relationship between them. These aspects included geodynamics, seismic and risk assessment, mineral exploration and hydrogeological research.