Structure, strain and AMS of the Uzunakhmat thrust sheet (Talas Range, Kyrgyz North Tian Shan)

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The Talas Range forms the northwest part of the Caledonides of the Northern Tian Shan. Based on differences in the structural style, metamorphism and sedimentary successions, three thrust sheets have been identified – the Uzunakhmat, Talas, and Kumyshtag thrust sheets. The Talas and Kumyshtag thrust sheets consist of Neoproterozoic-Ordovician terrigenous and carbonate rock units, whereas the Uzunakhmat thrust sheet consists of Neoproterozoic terrigenous rocks metamorphosed up to greenschist facies. The Uzunakhmat thrust sheet is separated from the Talas and Kumyshtag thrust sheets by the southwest-dipping Central Talas thrust (CTT). The dextral strike-slip Talas-Fergana Fault bounds the Uzunakhmat thrust sheet in the southwest. The main deformation events occurred in the Middle-Late Ordovician.

Structural and strain studies were done along profiles normal to the strike of folds and faults and located in the northwest and southeast parts of the Uzunakhmat thrust sheet. We also incorporate in our study structural profile in the central part of the Uzunakhmat thrust sheet, documented by Khudoley (1993) and Voytenko & Khudoley (2012).

The main strain indicators were detrital quartz grains in sandstones. Rf/φ and Normalized Fry methods were used to identify the amount of strain. Oblate ellipsoids predominate with Rxz values varying mostly from 1.6 to 2.4. Long axes of strain ellipsoids are sub-horizontal with the southeast to east-southeast trend. Similar trends have long axes of the anisotropy magnetic susceptibility ellipsoid being parallel to fold axes, cleavage-bedding intersection and mineral lineation as well as the trend of the major thrusts, including CTT.

The modern shape of the Uzunakhmat thrust sheet is similar to an elongated triangle, pinching out northwest and expanding southeast. Cross-section balancing corrected for the amount of strain shows along-strike decreasing of shortening in the southeast direction. Total shortening varies from 35% to 55% between sections located about 15 km from each other. Such significant variation in shortening corresponds to variation in structural style with much more tight folds and more numerous thrusts for cross-sections with a higher amount of shortening. However, the restored length of all cross-sections is quite similar pointing to the approximately rectangular initial shape of the Uzunakhmat thrust sheet. Our interpretation is that during the Caledonian tectonic events, the Uzunakhmat thrust sheet was displaced in the northwest direction with accompanied thrusting and folding of rock units within the thrust sheet. These deformations
formed the modern shape of the thrust sheet in accordance with the amount of shortening detected by cross-section balancing. This interpretation also implies that modern erosion did not significantly affect shape of the Uzunakhmat thrust sheet formed after the Caledonian deformation.
