

Paleoglaciology of the Ala-Archa and Ak-Shyrak areas, Kyrgyz Tian Shan

Robin Blomdin^{1,2}, Casey Beel², Marc W. Caffee³, Alexandru Codilean⁶, Natacha Gribenski¹, Jon Harbor², Jakob Heyman², Clas Hättestrand¹, Mikhail Ivanov⁵, Christine Kassab², Nathaniel A. Lifton^{2,3}, Dmitry Petrakov⁵, Irina Rogozhina⁴, Arjen P. Stroeven², Ryskul Usubaliev⁶

1. Department of Physical Geography and Quaternary Geology, Stockholm University, Stockholm, Sweden.
2. Department of Earth, Atmospheric, and Planetary Sciences, Purdue University, West Lafayette, IN, United States.
3. Department of Physics, Purdue University, West Lafayette, IN, United States.
4. GeoForschungsZentrum, Potsdam University, Potsdam, Germany.
5. Faculty of Geography, Lomonosov Moscow State University, Moscow, Russian Federation.
6. Central Asian Institute for Applied Geosciences, Bishkek, Kyrgyzstan.

We employed detailed glacial geomorphological mapping of the Ala-Archa and Ak-Shyrak areas, Kyrgyz Tian Shan (Shan = Mountains) to build a paleoglaciological reconstruction. These two areas were selected because their glaciers constitute important freshwater reservoirs for downstream communities (the Kyrgyz capital Bishkek, and cities along the Syr Darja which drains towards the Aral Sea, respectively), and because fluctuations in their extent cause both variations in water supply and risks for glacial hazards. Five landform categories were mapped; glacial valleys, marginal moraines, glacial lineations, hummocky terrain, and melt-water channels. These landforms were mapped using a SRTM digital elevation model (DEM) with a 90 m resolution, Landsat 7 ETM+ satellite imagery with a 30 m resolution, Aster GDEM with a 30 m resolution, and Google Earth. This remotely sensed mapping was also checked and complemented by field mapping. The distribution of mapped landforms indicates restricted glaciations, mainly concentrated to the mountain areas. In both ranges marginal moraines extend beyond the furthest extent of glacial valleys. Furthermore, extensive areas of hummocky moraine in Ak-Shyrak extending beyond montane glacial valleys indicate glacial extents into the intermontane basins. Several series of lateral and terminal moraines in the Ala-Archa and Ak-Shyrak ranges have been identified and sampled for cosmogenic nuclide ¹⁰Be dating, while associated glaciofluvial sediment was sampled for optically-stimulated luminescence (OSL) and electron spin resonance (ESR) dating. Future work will involve using these samples to build a consistent chronology for glaciation and investigation of contrasts between paleoglaciological reconstructions of valleys within a single range but with different aspects, as well as between ranges. In the final stages of the project we will use intermediate complexity glacier flow models to examine paleoclimatic implications of the observed spatial and temporal patterns of glacier changes, focused in particular on the last glacial cycle.