Exposure age evidence of Late Pliocene to Late Quaternary glaciation in Ak-Shyrak, central Kyrgyz Tian Shan

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The Tien Shan is a 2500 km long WSW–ENE trending arc of mountains dissecting the borders of the Xinjiang province in northwestern China, Kyrgyzstan and Tajikistan. The spatial and temporal patterns of glaciation in this extremely continental region are heavily influenced by several climatic systems, including the mid-latitude westerlies and the Siberian High pressure system. Glacial deposits in this region record the impact and relative importance of each of these climate systems. The aim of this project is to quantify past glacier variations in the Ak-Shyrak area of the Tien Shan in Kyrgyzstan. Our ultimate goal is to assess the influence of large-scale climate systems on glacier dynamics. We use geomorphological mapping and 10Be exposure dating of erratic boulders on glacial moraine deposits. We observe large site-specific scatter in our exposure ages. Apparent minimum exposure ages range from ~2 ka to ~2.5 Ma, with late Pliocene apparent exposure ages relating to some of the highest 10Be concentrations ever recorded for moraines. Most boulders with an exposure age range between 100 ka and 300 ka. We observe a spatial variation in timing of glaciation across the Tien Shan that might be due to differences in either paleoclimate or local physiographic conditions (e.g. altitude, slope, aspect). Because of the considerable scatter in our age data we refrain from assigning oxygen isotope stages to our mapped glacial advances. Finally, we assess and discuss possible reasons for the observed age scatter in terms of prior and/or incomplete exposure histories of individual samples and compare our data to other regional datasets.