Style and Timing of Glaciation along the Karakoram Fault

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The Karakorum fault system extends for ~ 1000 km from southwestern Tibet into the Pamir along the western margin of the Tibetan Plateau separating it from the Pamir-Karakorum region. Although it is one of the most prominent structures in the Himalayan-Tibetan orogen, nearly every aspect about the evolution and role of this fault is actively debated including its initiation age, magnitude of displacement, and current slip rate. In recent years, displaced Quaternary landforms, commonly moraines, have been used to help define geomorphic rates (10^1 to 10^6 years) of displacement along this fault zone, and to aid in understanding the landscape evolution of this region. However, determining the ages of Quaternary landforms in order to determie the geomorphic history of this region is challenging because of the general lack of organic material needed to date landforms and sediments by the standard Quaternary geochronological technique of radiocarbon dating and the inaccessibility of the region. Terrestrial cosmogenic nuclide (TCN) surface exposure methods are now allowing many of the landforms to be dated, which are providing new insights into the evolution of this fault system and the associated landscape. In particular, with regard to the style and timing of glaciation throughout the region are beginning to be defined. Defining the nature of glaciation is important since glaciation likely controls much of the erosion and sediment transfer along the fault system, and glacial and associated landforms are used to define the timing and rates of faulting. To define the style of glaciation and to examine regional correlation and variations, four main study areas along the length of the fault system have been examined. These include: Mustaga Ata and Kongur Shan; the Taskorgan and Wuqa valleys; the Nubra and Shyok valleys; and Gurla Mandata. Glacial and associated landforms were mapped in these regions and dated using ^{10}Be TCN methods (including >250 ^{10}Be dates). In each region, glacial landforms have been dated back to several glacial cycles, the oldest being >400 ka. Later glacial advances are progressively less extensive, changing from expanded ice cap glaciation to valley glaciation in style. The glacial story that is emerging is complex due to sharp contrasts in the timing and extent of glaciation across mountain ranges along the fault system, which are controlled by strong topographic and climatic gradients. This intricate picture of glaciation highlights the need to be cautious when assigning ages to landforms on the basis of morphostratigraphy in the region without adequate numerical dating to determine tectonic and geomorphic histories.

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