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Seasonal changes in glacier velocity detected in West-Kunlun, Tibet: Glacier erosion and subsequent mountain building?

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West Kunlun mountains are the highest areas in the planet when averaged over ˜100 km scale. Although Tibetan plateau is often termed as ”a roof of the world” because of the very high average altitude, we should note that the West Kunlun-shan is peculiar in terms of both its location at the northern-most edge of the Tibet and an absence of significant thrust faults/earthquakes in the nearby region. Why are the West Kunlun mountains so high?

We recently discovered by chance that there exists a significant seasonal variability in the glacier surface motion in one of the numerous mountain glaciers at West Kunlun mountains. Based on this finding, we discuss a possibility of the glacial erosion effects on the tectonic evolution of the mountains at West Kunlun. Numerous mountain glaciers at West Kunlun mountains have higher elevations greater than ˜4000 m, and are regarded as ”polar (or sub-polar)” glaciers despite the mid-latitudes (˜35N), implying that no seasonal changes in glacier velocity have been expected so far.

While numerous theoretical studies have suggested an intimate link between climate and tectonic evolution of mountain ranges, compelling observational evidence of an impact of climate on mountain building has been lacking (Whipple, 2009). The effects of erosion on friction-dominated critical-tapered orogens have been examined extensively, but those impacts could be even more stronger in thicker and hotter orogens. However, such examples have been fewer. We will discuss that the West Kunlun mountains could be an example for the active tectonic response in such a region to the glacial erosion.

Keywords: glacial erosion, mountain building, Kunlun mountains