

Diversity of Glacier Surface Velocity in the West Kunlun Shan, NW Tibet, Detected by Synthetic Aperture Radar

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Many mountain glaciers are developed in West Kunlun Shan (WKS) located in NW Tibetan plateau. Annual temperature and precipitation in WKS is 13.4 degree C and ~460mm, respectively (Zheng et al., 1988). Precipitation mainly occurs in warm season (May-Sept) (Kang and Xie, 1989). Glacier type in WKS are polar or poly-thermal glacier (Thompson et al., 1992), and clean type glacier. These previous studies, no/less short term velocity changes were expected at WKS. In this study, we detected surface velocity fields of a number of valley glaciers in West Kunlun Shan, using pixel-offset technique based on Synthetic Aperture Radar (SAR) data. We assumed that glaciers flow parallel to surface topography and converted results to surface velocity field. From our results, we elucidated diversity of glacier surface velocity in WKS. For example, we detected seasonal variation on Duofeng glacier, north-slope of WKS. Surface velocity during June-July was up to ~170% above winter background values. Surface velocity increased in warm season, so melt water probably caused seasonal variation in WKS. N2 and West Kunlun glacier was accelerated and advanced. Zhonfeng glacier, south-slope of WKS, was clearly decelerated and velocity distribution changed. Surface velocity abruptly decreased in the middle of a stream and no/less flowed in lower part (stagnant flow). These results coincided with glacier surge. Glacier surge caused acceleration / deceleration of surface velocity and advancing of terminus. According to result of Zhonfeng glacier, stagnant flow probably reflected quiescent period of glacier surge (Murray et al, 2003). Consequently, there were possibilities that precipitation and melt-water in warm season and glacier surge caused diversity of surface velocity of mountain glacier in WKS.

Keywords: SAR, mountain glacier, surface velocity, West Kunlun Shan, glacier surge, seasonal variation