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Investigating short-term glacial velocity variations in High Mountain Asia using remote sensing

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Glacier flow is a sensitive indicator of mass balance and dynamics. Monitoring changes in glacier flow at high temporal resolutions enables understanding of the glacier's sensitivity to short-term climate variability. We focus on different regions across High Mountain Asia (HMA) where glaciers have different average velocities (slow, median, and fast). HMA has the largest glacier coverage outside the polar regions and is considered the water tower of Asia. Previous studies have found that the glaciers in HMA are in tendency slowing down concomitant to losing mass at an accelerating rate. We use both optical and SAR remote sensing data including Sentinel-1 and -2, Planet and Pléiades images to present multiple remotely sensed calculated glacial velocities for the different regions of HMA over the last decade. We calculate the velocity variations using different tracking methods. By analysing the accuracy of the velocity variations through validation with the higher spatial resolution Pleiades velocity dataset and field data as well as using statistical techniques such as the GLAcier Feature Tracking testkit (Zheng et al., 2023), we provide insights into the accuracy of the different remote sensing data and tracking methods. Finally, we explore possible internal and external drivers of the observed glacial velocity variations, with a focus on mass balance and short-term climate variability.

Zheng, W., Bhushan, S., Van Wyk De Vries, M., Kochtitzky, W., Shean, D., Copland, L., Dow, C., Jones-Ivey, R., and Pérez, F.: GLAcier Feature Tracking testkit (GLAFT): a statistically and physically based framework for evaluating glacier velocity products derived from optical satellite image feature tracking, The Cryosphere, 17, 4063–4078, https://doi.org/10.5194/tc-17-4063-2023, 2023.