Automatic extraction of velocity time-series at mountain range scale from Landsat-8

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Worldwide glacier velocity products, such as GoLIVE, have recently become publicly available. They have the potential to identify and track speed changes on a large scale and at short time intervals. However, these products, derived from optical or radar satellite imagery, have different time-spans and contain noise and incomplete coverages due to clouds. In addition, as the volume of such data archives rapidly increases, rapid efficient data handling is needed.

Here we introduce an automatic post-processing procedure to merge these products and generate a reduced-noise, continuous and consistent time-series. The result, using GoLIVE data in this case, is a monthly velocity estimate stretching over the Saint Elias Mountains and its neighboring mountain ranges. With our spatio-temporal data set we can identify short-term dynamical changes in multiple glaciers on a regional scale, with a resolution as fine as individual tributary glaciers.

Within the Saint Elias & Kluane mountain ranges, several surges and their propagation characteristics are observed from April 2013 to April 2017. More complicated dynamics in the Wrangell mountains is also tracked. Our implementation is fully automatic and the approach is independent of geographical area or satellite system.