Short-term glacier velocity changes in the Southern Patagonian Ice Field detected by the Sentinel-1 satellite

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The glaciers of the Southern Patagonian Ice Field are the second largest group of glaciers in the Southern Hemisphere after Antarctica. Like the glaciers and ice sheet in Northern Hemisphere, they are retreating and losing their mass. Although the flow rate of glaciers in the Southern Patagonian Ice Field is known to change on a semi-annual to multi-year time-scale, their changes in flow rate within a year are uncertain. In order to investigate the detailed changes in the flow velocity, we obtained radar images acquired by the Sentinel-1B satellite with a recurrent period of 12 days between 2019 and 2020, and estimated the flow velocity at the relatively larger six glaciers using the pixel offset method on the assumption of parallel flow approximation. Of the six glaciers (Occidental Glacier, Pio XI Glacier, Asia Glacier, Tyndall Glacier, Viedma Glacier, O'Higgins Glacier), four (Pio XI Glacier, Asia Glacier, Viedma Glacier, O'Higgins Glacier) exhibit winter speed-up signals (Abe and Furuya, 2015), accelerating in winter and decelerating in summer. Pio XI Glacier, Asia Glacier, and Viedma Glacier showed significant changes in their downstream areas and accelerated by about 450%, 20%, and 30%, respectively, in winter. O'Higgins Glacier showed significant changes in the upstream, accelerating by 30% in winter. However, unlike the winter speed-up glaciers reported by Abe and Furuya (2015), the four glaciers except Pio XI glacier have not been known as surge-type glaciers. Moreover, it is not clear if any portion of those glaciers indicate so-called spring/summer speed-up signals like a number of mountain glaciers in Northern Hemisphere. We will extend the analysis period to confirm if the inferred short-term velocity changes are persistent every year.

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