

Space and Time Variations of Glacier Flow Velocities in Patagonia Icefield, Inferred from ALOS/PALSAR and Envisat/ASAR

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Recent studies of the Greenland and Antarctic ice sheets show that the ice sheets are thinning but accelerating, and contribute increasingly to global sea level rise. Meanwhile in the Patagonia Icefields, which are the world's largest temperate ice masses, flow velocity fields remain largely unknown because of the difficulty of field-based studies. There are a lot of glaciers, and most of these are reported to have been retreating recently. In order to estimate the effects of variation in glaciers and ice sheets on global sea level, it is important to understand the glacier flow in the Patagonia Icefields. In this study, we estimate flow velocity fields of glaciers in Patagonia, using Synthetic Aperture Radar (SAR), one of the all-weather microwave remote sensing techniques.

In this study, we detected glacier flow at some glaciers in the Southern Patagonia Icefield (SPI), including Perito Moreno glacier, using Pixel offset (Feature tracking) technique based on ALOS/PALSAR (2006~2011) and Envisat/ASAR (2002~) data. Then, we estimated flow velocities, assuming that the glaciers flow parallel to surface topography based on SRTM4 digital elevation model (DEM).

In addition, we estimated 3-D displacements of Perito Moreno glacier in another way without terrain information, using two SAR data acquired from ascending and descending orbits. We compared these results to the results of the above method.

The results show flow velocity fields at some glaciers in SPI from 2002 to 2011.

In Perito Moreno glacier, the inferred flow velocity reached a maximum of 3 m/day. This result is mostly consistent with previous studies. There are few temporal changes in the velocity fields between 2003 and 2011. In addition, we compared the results by two methods and found apparent differences in the vertical components of the flow velocities.

PioXI glacier shows rapid acceleration near the terminus in 2003 and 2005. This cannot be explained only by the seasonal variation, and is different from those at other glaciers.

We are also going to show our measurement results at Upsala glacier, Occidental glacier, and so on.

Keywords: ALOS, PALSAR, feature tracking, Patagonia, glacier flow