

Approach to high precision ice flow velocity mapping on Antarctic ice sheet

*Kaoru Shiramizu¹, Koichiro Doi^{1,2}, Yuichi Aoyama^{1,2}

1. The Graduate University for Advanced Studies (SOKENDAI), 2. National Institute of Polar Research

Observing temporal variations in ice flow velocities on glaciers and ice sheets is very important for understanding changes in the surrounding environment. We applied Differential Interferometric Synthetic Aperture Radar (DInSAR) and offset tracking to SAR data obtained on Antarctic ice sheet and glaciers for estimating the ice flow velocity.

DInSAR can estimate the velocities of gentle flow on ice sheet and upstream area of glaciers with high ground resolution (several meters), but it is inadequate to observe the displacement exceeding one pixel size of SAR image at downstream area of glaciers during the observation period. Offset tracking method is suitable for estimating the fast ice flow, although the displacement image obtained by this method has low ground resolution (more than 100m). Therefore, by combining these two methods selectively according to the ice flow velocity, it allows us to make an ice flow velocity map over wide area of the Antarctic ice sheet.

As a first step to combine the ice flow velocity maps estimated by DInSAR and the offset tracking, we compared these maps including their accuracy on the overlapped region. The study area was the ice sheet and glaciers around Skallen in the southern part of Sôya Coast, East Antarctica. We used 13 pairs of ALOS/PALSAR data and 2 pairs of ALOS-2/PALSAR-2 data, acquired during the period from November 2007 to January 2011 and from April 2014 to May 2015, respectively. GAMMA software was used for these analyses. The accuracy of the ice flow velocity estimated by DInSAR was approximately 0.04 m/day based on the GNSS measurements on the Antarctic ice sheet (Shiramizu et al., 2016). Based on this verification, we also verified the accuracy of the ice flow velocity estimated by offset tracking.

In this study, we will show the comparison result of two ice flow velocity maps obtained by DInSAR and offset tracking and discuss an approach for combining these ice flow velocity maps with the high precision.

Keywords: DInSAR, offset tracking, Antarctic ice sheet, ice flow velocity