



Accuracy improvement of the ice flow rate measurements on Antarctic ice sheet by DInSAR method

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DInSAR (Differential Interferometric Synthetic Aperture Radar) is an effective tool to measure the flow rate of slow flowing ice streams on Antarctic ice sheet with high resolution. In the flow rate measurement by DInSAR method, we use Digital Elevation Model (DEM) at two times in the estimating process. At first, we use it to remove topographic fringes from InSAR images. And then, it is used to project obtained displacements along Line-Of-Sight (LOS) direction to the actual flow direction. ASTER-GDEM widely-used for InSAR processing of the data of polar region has a lot of errors especially in the inland ice sheet area. Thus the errors yield irregular flow rates and directions. Therefore, quality of DEM has a substantial influence on the ice flow rate measurement.

In this study, we created a new DEM (resolution 10m; hereinafter referred to as PRISM-DEM) based on ALOS/PRISM images, and compared PRISM-DEM and ASTER-GDEM. The study area is around Skallen, 90km south from Syowa Station, in the southern part of Sôya Coast, East Antarctica.

For making DInSAR images, we used ALOS/PALSAR data of 13 pairs (Path633, Row 571-572), observed during the period from November 23, 2007 through January 16, 2011. PRISM-DEM covering the PALSAR scene was created from nadir and backward view images of ALOS/PRISM (Observation date: 2009/1/18) by applying stereo processing with a digital mapping equipment, and then the automatically created a primary DEM was corrected manually to make a final DEM.

The number of irregular values of actual ice flow rate was reduced by applying PRISM-DEM compared with that by applying ASTER-GDEM. Additionally, an averaged displacement of approximately 0.5cm was obtained by applying PRISM-DEM over outcrop area, where no crustal displacement considered to occur during the recurrence period of ALOS/PALSAR (46days), while an averaged displacement of approximately 1.65 cm was observed by applying ASTER-GDEM. Since displacements over outcrop area are considered to be apparent ones, the average could be a measure of flow rate estimation accuracy by DInSAR. Therefore, it is concluded that the accuracy of the ice flow rate measurement can be improved by using PRISM-DEM.

In this presentation, we will show the results of the estimated flow rate of ice streams in the region of interest, and discuss the additional accuracy improvement of this method.