

Flow velocity and ice sheet elevation of Shirase Glacier and Totten Glacier from SAR and Laser altimetry

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The whole area of Antarctica ice mass balance has already calculated by previous studies (eg. Rignot et al., 2019). However, Antarctic glaciers have various flow rates, which might be related to their responses to climate change, therefore present flow dynamics observation at high spatial and temporal resolutions is necessary.

This study estimates two glaciers' ice flow velocity and ice elevation profiles in available parts. Two glaciers which are Totten Glacier and Shirase Glacier in the East Antarctica were chosen in this study. Previous studies found out that Totten Glacier has been melted rapidly (Li et al., 2016; Rignot et al., 2013), whereas Shirase Glacier is one of the fastest ice streams in Antarctica (Nakamura et al., 2010; Rignot et al., 2011). We estimated the ice flow velocities using Synthetic Aperture Radar (SAR) images corrected by C-band SAR onboard Sentinel-1A/-1B in 2018 to 2019 and the Phased Array L-band SAR-2 (PALSAR-2) onboard Advanced Land Observing Satellite-2 (ALOS-2) in 2017 to 2018.

The Geoscience Laser Altimeter System (GLAS) on the Ice, Cloud, and land Elevation Satellite (ICESat) and the Advanced Topographic Laser Altimeter System (ATLAS) instrument onboard ICESat-2 provide accurate global elevation data. ICESat-2 was launched on September 15, 2018, which is the newest laser altimeter satellite at this time. ICESat data is available from 2003 to 2009 and ICESat-2 data are available from 2018 to 2019. Laser altimetry data are combined with the existing digital surface models (DSM) like the Reference Elevation Model of Antarctica (REMA) and ALOS World 3D-30m (AW3D30) which have some data missing. Laser altimetry data was used to fill some data missing of DSM.

In the presentation, we will estimate ice volume change and ice flux from glacier to compare with the past results using flow velocity data and elevation data. We will also try to cover some data missing in the DSMs using the elevation data. DSMs are necessary for using estimating flow velocities from other SAR data processing techniques like InSAR.

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