A short-term assessment of summer and winter velocities of glaciers in the Amery Ice Shelf, Antarctica

Robust monitoring of the glacier dynamics plays an important role to understand the changes that occur in the glaciers using a large archive of remote sensing as a most effective tool for monitoring glacier parameters. The primary objective of this study was to derive the velocity of the eastern tributary glaciers of the Amery ice shelf using C-band Synthetic Aperture Radar (SAR). The secondary objective was to compare the winter and summer velocity of the glaciers for 2017-2018. The study was conducted using the European Space Agency’s (ESA) Copernicus program Sentinel-1 satellite’s SAR data that operates in the C-band. The Offset tracking method has been applied to the ground range detected product obtained from Sentinel-1 satellite. The eastern tributary of Amery Ice Shelf comprises of two glaciers near the Clemence Massif and one glacier near the Pickering nunatak that drains ice from the American Highland, East Antarctica. The glaciers near the Clemence Massif have low annual velocity of 100 myr–1 in the initial portion of the glacier to around 300 myr–1 near the end of the glacier where it merges with the Amery ice shelf. The glacier flowing near the Pickering Nunatak have moderate annual velocity ranging from 150 myr–1 at its head reaching up to 450 m yr–1 near the tongue of the glacier. The velocity in summer was observed to be higher than the velocity in winter and the difference between the summer and the winter velocities was found to be between 50 and130 myr–1. The accuracy of the derived results was calculated based on bias measurements and by using the RMSE (Root Mean Square Error) method by comparing it to the previous MEaSUREs (Making Earth System Data Records for Use in Research Environments) yearly velocity (at 450 m and 1 km resolution) available on the NSIDC (National Snow & Ice Data Center) portal. The bias in the results did not exceed 20 myr–1 for the three glaciers and the accuracy exceeded 85% for most of the regions.