

Advance of Western Margin of the Vavilov Ice Cap Assessed by Remote Sensing Data

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The Vavilov ice cap (79.30° N, 95.47° E) is situated on October Revolution Island of the Severnaya Zemlya archipelago. The purpose of this work is to reconstruct the position of the western margin of Vavilov ice cap using remote sensing data covering the period 1963-2016. The images from Landsat-1, 5, 7, 8, Terra (ASTER) and Corona were applied. The main criteria for image selection were minimal cloudiness, minimal quantity of sea ice near the ice cap front, sufficient illumination, and preferably the end of ablation period. As a result, 27 images were selected. All of them were pansharpened and their georeference was corrected using images from Landsat-8. Then the ice cap margin was digitized manually and main metrical parameters were calculated. As a result, we found out that from 1963 to 2016 the ice cap margin advanced seaward more than by 11 km, and its area increased by 125.6 km^2 . The accelerated advance started in 2010, and from 2010 to 2015 the margin advanced by 5.5 km. In summer 2016 the marginal front terminated in sea began to disintegrate.

To evaluate the volume changes of western part of Vavilov ice cap digital elevation models (DEM) were used. We used ASTER DEMs of 2000 and 2015, which were applied to estimate changes above sea level, and radar data obtained during fieldwork in 2014 and topographic maps of scale 1:200 000 to estimate changes below sea level. Above the contour line of 100 m (2015) the main trunk of the newly formed outlet glacier thinned by at least 1.918 km^3 , and at the same time its snout increased by 4.101 km^3 .

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