Evaluating land fast ice ridging near Utqiaġvik Alaska using TanDEM-X interferometry

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Landfast sea ice is an important feature along most Arctic coastlines. Landfast ice plays an important role for community travel, industry operations and marine mammals. Therefore, its stability has a vital role for landfast ice users. Land fast ice stability is determined by several factors including grounded pressure ridges. Existence of grounded pressure ridges can prevent land fast ice breakouts and keep the ice stable for longer periods.

We present an approach where Synthetic Aperture Radar Interferometry (InSAR) from single-pass TanDEM-X satellite data is used for formation of ridges over landfast ice. The method provides a tool for evaluation of the dynamics of ridge formation, improved characterization of the ridges and estimation of the stability of the land fast ice. This study presents results for formation of ridges near, Utqiaġvik, Alaska.

Two X-band SAR bistatic image pairs acquired on the 13th and 24th of January 2012 have been studied in detail. Two interferograms were constructed using the Sentinel Toolbox (S1TBX). Interferometric digital elevation models (DEMs) were calculated and subtracted from each other. A (5×5) boxcar filter was applied over the result to reduce noise. Changes in surface elevation between the two dates have been analyzed and used to identify formation of ridges. Results were compared with ridge formation registered by a marine radar situated in Utqiaġvik and with ice drift information generated by a sea ice tracking algorithm using single SAR images.