

# Local irregular displacements on Greenland ice sheet detected by double differential InSAR

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Differential Interferometric Synthetic Aperture Radar (DInSAR) is an effective method to detect surface displacements over ice sheet. Phase difference of microwave recorded in InSAR image mainly consists of signals induced by surface topography and displacement. Phase change due to topography (topographic phase) can be removed by subtracting simulated phase change calculated from Digital Elevation Model (DEM). InSAR image after removing topographic phase is called DInSAR image, and signals due to surface displacements are contained in a DInSAR image.

Stable ice sheet flow is a dominant component of surface displacements over ice sheet. Differential DInSAR (DDInSAR) means a procedure to take difference between two DInSAR images. Irregular surface displacement such as ice sheet flow rate change can be detected by applying DDInSAR technique, because phase change due to steady surface displacement is canceled out by taking the difference.

We applied DDInSAR technique to the data observed by ALOS/PALSAR over northwestern region of Greenland ice sheet, whose scene index (path-frame) is 76-1590. The scene was observed three times in series at August 30, October 15, and November 30 in 2007. One DDInSAR image was derived from two DInSAR images generated from PALSAR data at October 15 and August 30 (DI20071015-20070830) and from those at November 30 and October 15 (DI20071130-20071015). Fig. 1 shows difference of displacements in direction along line of sight (LOS) of radar illumination derived from DI20071130-20071015 and DI20071015-20070830 by applying DDInSAR.

Fig. 2 shows an enlarged image of dashed rectangular in Fig. 1. Several small round-shaped displacement differences are found in northeastern portion of Fig. 2. The blue color indicates decrease of distance between satellite and the ice sheet surface, and the red color indicates increase of the distance. Every three round-shaped signals in dashed circle A indicate decrease of the distance. The maximum spatial size of the signals is approximately 2 km and the distance change reaches 15 cm. In the presentation, we are going to discuss the meaning of the signals.

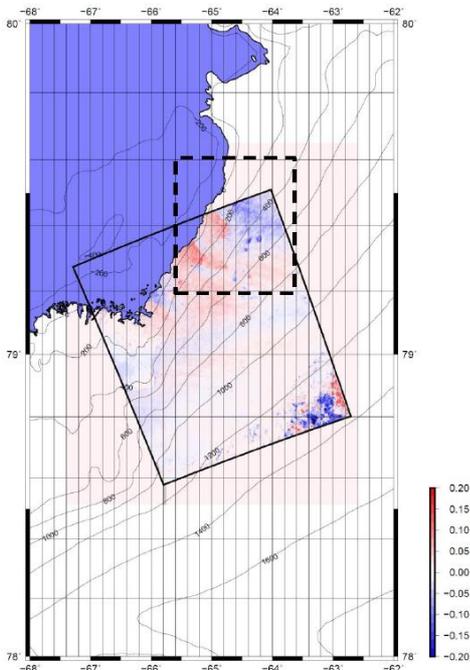


Figure 1. Difference of LOS displacements derived by applying DDInSAR to ALOS/PALSAR data at August 30, October 15 and November 30 in 2007. Unit of scale bar and contour are meter. Blue color indicates decrease of distance from satellite to surface and red color indicates increase of the distance.

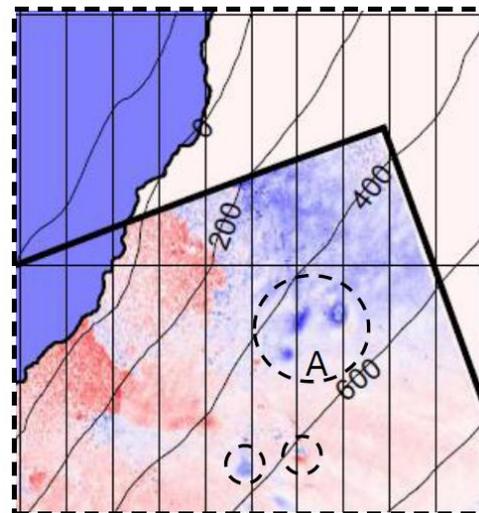


Figure 2. Enlarged image of dashed rectangular region in Fig.1. Spatial size of the largest round-shaped signal in dashed circle A is approximately 2 km and the distance decrease reaches 15 cm.