Title: Landfast ice monitoring in the Canadian Arctic using Sentinel-1

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Sea ice fastened to the Arctic coasts, the so-called landfast ice, has declined significantly during the last few decades, with a delayed onset and an earlier break-up timing. A shorter landfast ice duration impacts communities using it for travel purposes due to its reduced stability in response to fewer grounded ridges capable of withstanding wind, ocean, or ice forcing. This study explores how SAR interferometry (InSAR) expands current understanding of fast ice stability regimes. This technique exploits the phase difference between two complex radar SAR images of the same area acquired at a different time and extracts information on changes on the Earth's surface producing an interferogram and a coherence image. This procedure was applied to ESA Sentinel-1 image pairs with a temporal lag of 12 days corresponding to the satellite revisit time which ensured higher coherence compared to longer intervals. This choice allowed us to outline a preliminary fast ice boundary remaining stable for a minimum of 12 days in comparison to drift ice moving daily, and this result was further validated by SAR amplitude imagery. Fringe patterns of the interferogram were extracted to delimit different fast ice regimes since they are significantly impacted by grounded ridges and bottom-fastened ice causing a significant reduction in their density. Lastly, information on surface displacements was paired with changes in the ice thickness to assess changes in the vertical direction. Satellite altimeters were used to provide additional information due to their complementary spatiotemporal sampling and resolution.