



ICESat GLAS Elevation Changes and ALOS PALSAR InSAR Line-Of-Sight Changes on the Continuous Permafrost Zone of the North Slope, Alaska

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Measuring centimeter-scale and smaller surface changes by satellite-based systems on the periglacial terrains and permafrost zones of the northern hemisphere is an ongoing challenge. We are investigating this challenge by using data from the NASA Ice, Cloud, and land Elevation Satellite Geoscience Laser Altimeter System (ICESat GLAS) and the JAXA Advanced Land Observing Satellite Phased Array type L-band Synthetic Aperture Radar (ALOS PALSAR) on the continuous permafrost zone of the North Slope, Alaska. Using the ICESat GLAS exact-repeat profiles in the analysis of ALOS PALSAR InSAR Line-Of-Sight (LOS) changes we find evidence of volume scattering over much of the tundra vegetation covered active-layer and surface scattering from river channel/banks (deposition and erosion), from rock outcropping bluffs and ridges. Pingos, ice-cored mounds common to permafrost terrains can be used as benchmarks for assessment of LOS changes. For successful InSAR processing, topographic and tropospheric phase cannot be assumed negligible and must be removed. The presence of significant troposphere phase in short-period repeat interferograms renders stacking ill suited for the task of deriving verifiable centimeter-scale surface deformation phase and reliable LOS changes.

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