

## **Detecting land surface changes of the tundra landscape in the central Lena Delta based on coherence maps and ground observations**

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Permafrost is a subsurface phenomenon and cannot be directly observed by means of remote sensing. However, surface processes, straightly related to the dynamics of permafrost, can be detected by satellites. SAR interferometry (InSAR) is a useful tool to detect vertical surface displacements linked to ground thawing and freezing. One of the main obstacles for InSAR technique is the loss of coherence (or interferometric correlation) which is defined as the complex cross-correlation coefficient of the SAR image pair and reflects the presence or absence of the changes in radar backscatter properties of the surface. Such changes can be caused by snow cover, vegetation growth, rapid land movements like thaw slumps and landslides, or soil moisture changes. Image pairs with little correlation (correlation coefficient close to zero) cannot be used for a displacement analysis, but, if interpreted correctly, the weak correlation is evidence for surface changes.

Based on a unique TerraSAR-X dataset at the study site the coherence maps of the central Lena River Delta were created with a spatial resolution of up to 3 m. The high temporal resolution of the dataset allows to detect changes of the land surface on different time scales ranging from 11 days to months. The spatial and temporal variability of the coherence is investigated together with an existing land surface classifications and meteorological data.

In addition, different target regions in the central Lena River Delta are equipped with manual and automatic ground truth stations for measuring surface changes such as thaw subsidence, surface soil moisture, and surface temperature.

This project is performed in cooperation with the German Space Agency (DLR) and University of Oslo.