



InSAR detection of permafrost landform dynamics at Kapp Linné central Svalbard

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Permafrost is one of six cryospheric indicators of global climate change. As permafrost contains various forms of ground ice, thawing, degradation and speed up of particularly ice-rich periglacial landforms can lead to substantial landscape change and development. This has geomorphological, biological and socio-economical impacts, with changes in the water balance, increase in greenhouse gas emissivity, changes in flora and fauna and impacts on infrastructure. The present scientific challenge is to combine detailed site/point scale geomorphological field process observations with remote sensing data covering at landscape scale. We apply a multi-temporal satellite radar interferometric (InSAR) method to data obtained using the TerraSAR-X satellite. TerraSAR-X has a high spatial resolution and with 11 days repeat cycle, it is well suited to detect seasonal permafrost deformation. To test the usability of X-band InSAR data, we compare hourly field measurements between 2008-2011 of solifluction ground deformation at Kapp Linné, central Svalbard, with InSAR deformation time-series. We show that InSAR is able to pick up the seasonal deformation patterns of frost heave, ground settlement and associated solifluction as well as the interannual downslope movement. These results are a promising first step towards successful upscaling periglacial field point measurements to landscape scale, enabling observations of periglacial processes in larger parts of the permafrost landscapes.