Examining Environmental Gradients with satellite data in permafrost regions – the current state of the ESA DUE GlobPermafrost initiative

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Permafrost cannot be directly detected from space, but many surface features of permafrost terrains and typical periglacial landforms are observable with a variety of EO sensors ranging from very high to medium resolution at various wavelengths. In addition, landscape dynamics associated with permafrost changes and geophysical variables relevant for characterizing the state of permafrost, such as land surface temperature or freeze-thaw state can be observed with space-based Earth Observation. Suitable regions to examine environmental gradients across the Arctic have been defined in a community white paper (Bartsch et al. 2014). These transects have been revised and adjusted within the DUE GlobPermafrost initiative of the European Space Agency.

The ESA DUE GlobPermafrost project develops, validates and implements Earth Observation (EO) products to support research communities and international organisations in their work on better understanding permafrost characteristics and dynamics. Prototype product cases will cover different aspects of permafrost by integrating in situ measurements of subsurface properties and surface properties, Earth Observation, and modelling to provide a better understanding of permafrost today. The project will extend local process and permafrost monitoring to broader spatial domains, support permafrost distribution modelling, and help to implement permafrost landscape and feature mapping in a GIS framework. It will also complement active layer and thermal observing networks. Both lowland (latitudinal) and mountain (altitudinal) permafrost issues are addressed.

The status of the Permafrost Information System and first results will be presented. Prototypes of GlobPermafrost datasets include:
- Modelled mean annual ground temperature by use of land surface temperature and snow water equivalent from satellites
- Land surface characterization including shrub height, land cover and parameters related to surface roughness
- Trends from Landsat Time series over selected transects
- For selected sites: subsidence, ground fast lake ice, land surface features and rock glacier monitoring

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