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Evaluation Case Studies and Intercomparison with Regional Climate Model Simulations based on the DUE PERMAFROST Circumpolar Remote Sensing Service for Permafrost

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Permafrost is a subsurface phenomenon. However, monitoring from Earth Observation (EO) platforms can provide spatio-temporal data sets on permafrost-related indicators and geophysical parameters used in modelling and monitoring. The ESA Data User Element (DUE) Permafrost project (2009-2012) developed a suite of EO satellite-derived products: Land Surface Temperature (LST), Surface Soil Moisture (SSM), Surface Frozen and Thawed State (Freeze/Thaw), Terrain, Land Cover, and Surface Water. The satellite-derived products are weekly and monthly averages of the bio- and geophysical terrestrial parameters and static circum-Arctic maps. The final DUE Permafrost products cover the years 2007 to 2011 with a circum-Arctic coverage (north of 50°N). The products were released in 2012, and updated in 2013. Further information is available at geo.tuwien.ac.at/permafrost/. The remote sensing service also supports the EU-FP7 funded project PAGE21 - Changing Permafrost in the Arctic and its Global Effects in the 21st Century (www.page21.eu).
The Global Terrestrial Network for Permafrost (GTN-P), initiated by the International Permafrost Association (IPA), is the prime program concerned with monitoring of permafrost. It provides an important database for the evaluation of EO-derived products and climate and permafrost models. GTN-P ground data ranges from air-, ground-, and borehole temperature data to active layer monitoring, soil moisture measurements, and the description of landform and vegetation. The involvement of scientific stakeholders and the IPA, and the ongoing evaluation of the satellite-derived products make the DUE Permafrost products relevant to the scientific community.
The Helmholtz Climate Initiative REKLIM (Regionale KlimaAnderungen/Regional Climate Change) is a climate research program where regional observations and process studies are coupled with model simulations (http://www.reklim.de/en/home/). ESA DUE Permafrost User workshops initiated the use of EO-derived products for inter-comparison experiments. Within the REKLIM framework, the geophysical surface parameters simulated by regional climate models (RCMs) are spatio-temporally compared with the EO-derived products. Investigated products consist of those generated during the DUE Permafrost project as well as products from ESA DUE GlobSnow (Snow Extent and Snow Water Equivalent, Global Snow Monitoring for Climate Research, 2008-2011) and the MODIS albedo product (MOD 43). We compared the simulated fields of surface temperature and frozen/unfrozen ground state simulated by RCMs HIRHAM (circum-Arctic domain) and COSMO-CLM (Central Siberia) with the same fields derived from satellite remote sensing.