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Estimating thermal offset between land surface and screen height air temperature over the pan-Arctic region using operational satellite images

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Operational satellite thermal infrared radiometers (TIR) such as AATSR aboard of ENVISAT and MODIS aboard of Aqua and Terra satellites provide a useful means to monitor land surface temperature (LST) over the pan-Arctic region on a regular basis. Recently, 2-m screen height air temperature (AT) was derived during the snow free period from 18.7 and 23.8 GHz H and V-pol brightness temperature measurements acquired from the AMSR-E sensor aboard of the Aqua satellite.
The thermal offset between screen height air temperature and land surface temperature is an important variable in permafrost studies but usually derived from ground-based measurements. In this research project, thermal offset maps over the entire pan-Arctic were calculated during clear-sky conditions as a difference between screen air temperature derived from AMSR-E and operational LST derived from AATSR and MODIS level 2 products during the snow free period between 2005 and 2010. Produced thermal offset maps had a spatial resolution of 25 km and were calculated from weekly and monthly aggregated AT and LST data. The thermal offset product is verified against ground measurements from weather stations available in North America and Eurasia. Differences in thermal offset during the last five years were compared and observed patterns were explained by surface cover type and water fraction.