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MODIS-Derived Arctic Land-Surface Temperature Trends

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Physical changes across the Arctic are driven in part by variations of land-surface heat absorption, conduction and re-radiation relative to solar irradiance. These changes manifest in active layer thickening and thinning, ground ice and ice wedge melting, thawing of permafrost and release and storage of carbon, energy fluxes and water. Using the MODIS sensors on NASA Aqua and Terra from March 2000 through July 2012 we investigate Arctic land-surface temperature under clear-sky condition changes and regional variations. Over this period we detect an increase in the number of days with daytime land-surface temperature above 0 degrees C: an additional 14 days for the decade. There are significant trends of increasing morning and afternoon land-surface temperatures with regional variations, on average. Variations in land-surface temperature are due to heterogeneity of surface material heat capacity and conduction. In a more general sense this is due to proportions of bare ground, ice, snow, vegetation, surface hydrology including palsa, thaw lakes and wetlands and geomorphology relative to the daytime clear-sky and seasonal variations of solar irradiance.