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# Mapping gradual changes in boreal forests using MODIS time series

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The paper is aimed to show the potential of satellite-based Earth Observation (EO) towards the improved understanding of land-surface processes in boreal forests. Attention was paid to restrictions in multi-scale EO, where EO platforms are considered the primary data source for area-wide, daily, monthly or yearly time-series analyses. The MOD11C3 data set 'Clear Sky Days' for example is defined as the number of days with a valid land surface temperature measurement under clear sky conditions. It is thus an indicator for the cloud-free number of daily MODIS Terra observations in the region and shows the applicability of the Terra sensor with respect to location and season.

Our study area is the Irkutsk Province, Russian Federation, that is characterized by intensive large area changes of forests. A 8-year record of monthly MODIS-Terra data has been used to detect gradual changes in forested areas to better understand inter-annual variations of photosynthetic activity (NDVI) and surface temperature. Increasing temperatures are a major stress factor on forest physiology and force the outbreak of insect calamities and forest fires in the region. Moreover, permafrost is influenced with rising risk potentials for infrastructures. The datasets were regressed for every month over eight years. Trends are analyzed on a confidence level of 95%. The standard t-test were calculated to detect step changes within the data. By applying the linear regression model on the satellite time series it was possible to detect linear changes of the pixel values over time. These linear variations of the surface reflectance/ radiance were detected either as positive or negative trends and indicate different natural and human-induced processes such as respiration, stepwise clearcut-

ting, permafrost melting or the steady rise of days with cloud cover.