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Using Earth Observation Data for the Multivariate and Multiscale Trend Analysis in the Arctic Regions between 1981 and 2012

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ABSTRACT:

Predictions from Global Climate Models have shown increasing trends of global temperature for the 21th century. Since the arctic regions are highly vulnerable to global climate changes, rising temperatures will lead to an intensification of vegetation activity which benefits the extension of the boreal forest into tundra areas. Especially the recruitment of trees into the northern regions, which were controlled by summer temperature and the length of the growing season, is of high importance for the Global Climate System.
Changes in temperature as well as precipitation conditions are having an impact on snow cover, vegetation productivity and coverage, vegetation seasonality, surface albedo and permafrost dynamics. This study focuses on the co-occurrence of temperature, precipitation, snow cover and vegetation greenness trends in the pan-arctic circle between 1981 and 2012. Precipitation significantly increased during summer and fall. Temperature has the strongest increase during the winter months. The snow water equivalent has the highest trends during the transition seasons of the year. Vegetation greenness trends are characterizes by a constant increase during the vegetation growing period. High resolution remote sensing data have been utilized to map structural vegetation changes between 1973 and 2012 for a selected test region in northern Siberia within the EU FP7 EURUCAS project. An intensification of woody vegetation cover at the taiga-tundra transition area has been found. The observed co-occurrence of climatic and ecosystem changes demonstrates the multi-scale feedbacks in the arctic ecosystems.

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