



## **Different satellite products show contrasting patterns in the greening of the North**

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The higher northern latitudes have received the brunt of the increases in temperatures caused by climate change. Primary productivity is expected to increase, due to CO<sub>2</sub> fertilization and the removal of thermal limitations with higher temperatures. This is translated into an increase of green leaf density, as expressed by the Leaf Area Index (LAI), which can be retrieved from satellite observations over large geographic extents. Several global LAI products are now available covering the past three decades. They differ both in how the satellite reflectances are normalized and how LAI is retrieved from them, potentially leading to alternative results that are difficult to validate properly. Here we provide a systematic inter-comparison of three major products and try to explain the reasons behind their discrepancies. The AVHRR-based GIMMS-NDVI version 3g (LAI3g), the Land Long-Term Data Record (LTDR) and the Long-term Global Mapping (GLOBMAP) series are compared between 1982 and 2011 at a 0.05° spatial resolution at high northern latitudes (>50°N). The focus is placed on the boreal summer period, over which the trends in the seasonal properties of vegetation are summarized using the mean and the maximum LAI. These metrics are evaluated against an independent proxy for aboveground vegetation biomass available from passive microwave and known as Vegetation Optical Depth (VOD). Ancillary information in the form of forest cover and water occurrence maps are also used to better understand ecosystem responses. LAI from LTDR and VOD indicates similar changes in vegetation activity over their common temporal record over large geographic areas totaling 60% of the study area. Conversely, LAI from GLOBMAP shows conflicting patterns for 60% of the study area. Greening is especially pronounced in the LTDR data, whereas GLOBMAP shows a slightly negative trend. Finally, we have found a stronger, but not complete agreement between LTDR and LAI3g, and larger discrepancies with the behavior of GLOBMAP. These results are a warning that the patterns in the greening of the North are not uniformly represented by all products and that care should be taken when using these to make larger assessments of ecosystem-response to climate change over the last decades.