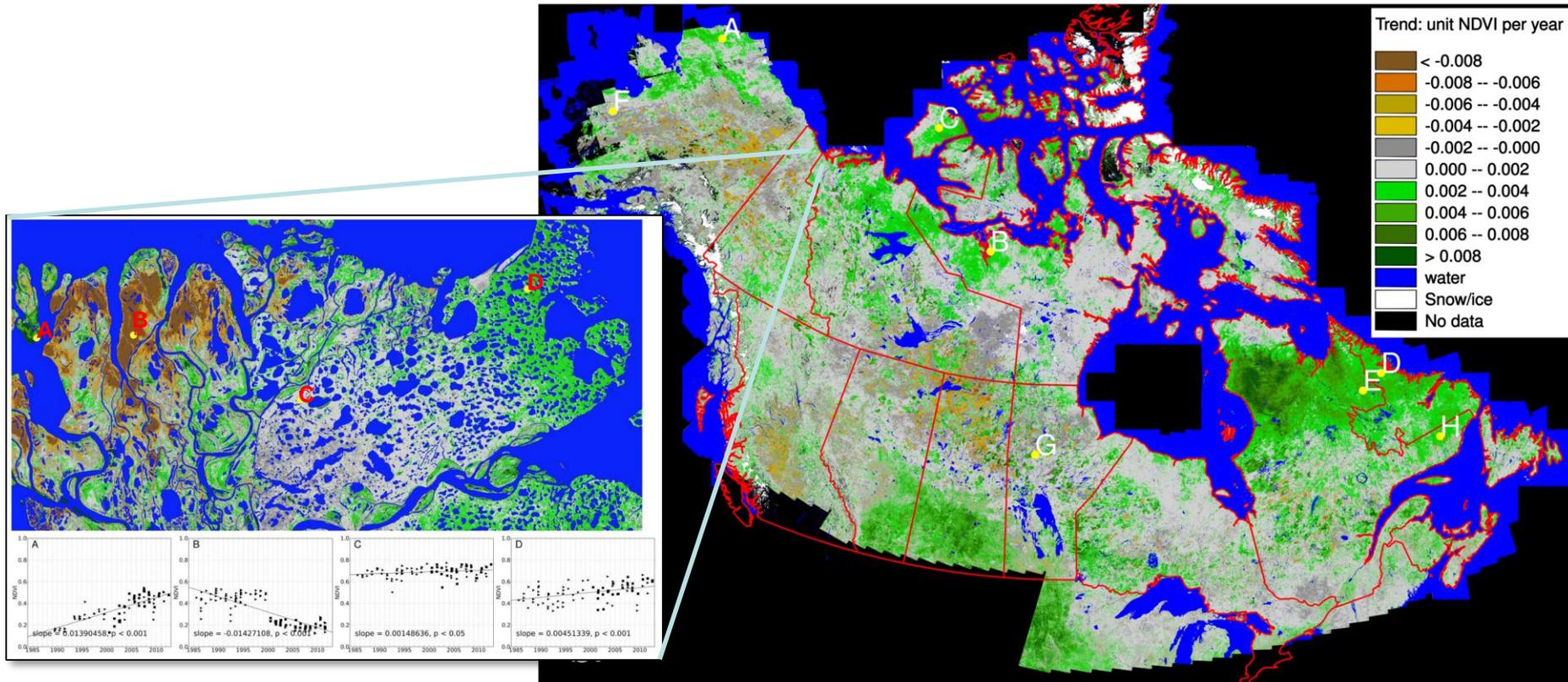




# Landsat Analysis Zooms In On High Latitude Vegetation Greening

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- Previous studies have indicated widespread circum-Arctic “greening” in response to climate warming, but relied on coarse-resolution AVHRR data sets.
- 87,000 Landsat images from 1984-2012 were analyzed to measure per-pixel NDVI trends across Canada and Alaska at 30m resolution for the first time
- Results confirm greening found in earlier AVHRR-based studies but with significant regional differences:
  - More pronounced NDVI increases in eastern Canada (Quebec)
  - Smaller NDVI increases in Alaska
  - Most NDVI decreases tied to areas of known disturbance (fire, insect)



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### References:

Ju, J., and Masek, J.G., The vegetation greenness trend in Canada and US Alaska from Landsat data, submitted to Remote Sensing of Environment, September 2015

**Data Sources:** NASA/USGS Landsat-5 and Landsat-7 data; comparisons with GIMMS 3g AVHRR data set.

### Technical Description of Figures:

**Graphic 1 (right):** Mid-summer Landsat-5 and Landsat-7 surface reflectance images from 1984-2012 were downloaded from USGS, screened for clouds and snow, and then converted to Normalized Difference Vegetation Index (NDVI). For each 30m pixel, the linear temporal trend and statistical significance was calculated. The map shows the magnitude of the trend, either NDVI increasing in time (green) or decreasing in time (brown/yellow). Areas with no trend or where insufficient clear pixels could be obtained are grey and black, respectively.

**Graphic 2 (inset, left):** Top: zoom-in of NDVI trend map for the Mackenzie Delta region, Canada, showing the spatial detail and variability visible in the Landsat-based analysis. Bottom: example NDVI time series from four locations within the Mackenzie Delta. The y-axes are NDVI, and the x-axes are time (1984-2012).

### Scientific significance, societal relevance, and relationships to future missions:

Climate change is expected to result in profound changes to global ecosystems over the next several centuries. Some areas currently limited by cold and short growing seasons may experience increased plant cover and/or replacement of cold-tolerant vegetation communities. In other parts of the globe, vegetation stress due to increased aridity and/or increased summer temperatures may lead to widespread plant mortality. High-latitude regions are warming more rapidly than any other part of the globe. Previous ground- and satellite-based studies have indicated that circum-Arctic regions are “greening”, ie. experiencing increased leaf-area and biomass. This study both confirms that trend for northern North America, and also provides a much higher-resolution view of the phenomenon, allowing analysis of local differences in vegetation response.