**Cover letter**

Dear Editorial Board of Ecography,

Please consider our manuscript “**lsatTS: an R package for generating vegetation greenness time series using Landsat satellite data**” for publication as a Software Note.

The Landsat satellites provide long-term surface reflectance measurements that are invaluable for monitoring and understanding spatial variability and temporal changes in Earth’s terrestrial ecosystems. In recent years, it has become easier to access, process, and analyze Landsat data; however, there are still challenges that hinder use of these data by ecologists, land managers, and other non-remote sensing specialists. Our manuscript describes a new software package for R that facilitates sample-based time series analysis of surface reflectance and spectral indices derived from multispectral sensors on the Landsat satellites. The package enables users to extract the full Landsat 5, 7, and 8 records for point sample locations or small study areas using Google Earth Engine accessed directly from R. Moreover, the package includes functions for (1) rigorous data cleaning, (2) cross-sensor calibration with machine learning, (3) phenological modeling, and (4) time series analysis. Our manuscript introduces this new software, describes it’s functionality, and provides an example application focused on long-term changes in vegetation greenness across a study area in Greenland. Overall, this new software provides a suite of functions to enable broader use of Landsat satellite data for monitoring and understanding terrestrial ecosystem dynamics over the past four decades across local to global geographic extents.

Thank you for considering our manuscript for publication in *Ecography*.

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**Significance statement**

Our manuscript describes a new software package for R that enables a broad community of users to assess terrestrial ecosystem dynamics at sample locations anywhere on Earth’s surface using four decades of Landsat satellite measurements. We developed the underlying code for this software primarily as part of NASA-funded research projects that assessed multidecadal trends in vegetation greenness and their links with climate change across the Arctic tundra and boreal forest biomes (Berner, et al. 2020, Berner and Goetz 2022). These two macroecological studies constitute the first ever assessments of vegetation greenness trends across these northern biomes using Landsat satellite data, and highlight mounting impacts of climate change on terrestrial ecosystems. We have also recently used this remote sensing approach in several other studies focused on vegetation response to climate (Walker, et al. 2021), insect outbreaks (Boyd, et al. 2019, Boyd, et al. 2021), wildfires (Gaglioti, et al. 2021), and permafrost degradation (Verdonen, et al. 2020) in northern ecosystems. During these projects, it became evident there is extensive interest in our approach to accessing, processing, and analyzing time series of vegetation greenness derived from Landsat data. Therefore, we decided to create a well-documented, user-friendly, open-source software package that will make it much easier for ecologists, biologists, and land managers to assess spatial variability in terrestrial ecosystem dynamics during recent decades using Landsat satellite data. Our manuscript describes new open-source software that will advance our collective understanding of spatial and temporal patterns in ecology; hence we believe it is very well suited for publication as a Software Note in Ecography.

Berner, L. T., et al. 2020. Summer warming explains widespread but not uniform greening in the Arctic tundra biome. - Nature Communications 11: 4621.

Berner, L. T. and Goetz, S. J. 2022. Satellite observations document trends consistent with a boreal forest biome shift. - Global Change Biology 00: 1-18.

Boyd, M. A., et al. 2019. Impacts of climate and insect herbivory on productivity and physiology of trembling aspen (Populus tremuloides) in Alaskan boreal forests. - Environmental Research Letters 14: 085010.

Boyd, M. A., et al. 2021. Historic declines in growth portend trembling aspen death during a contemporary leaf miner outbreak in Alaska. - Ecosphere 12: e03569.

Gaglioti, B., et al. 2021. Tussocks enduring or shrubs greening: Alternate responses to changing fire regimes in the Noatak River Valley, Alaska. - Journal of Geophysical Research: Biogeosciences 126: e2020JG006009.

Verdonen, M., et al. 2020. Periglacial vegetation dynamics in Arctic Russia: decadal analysis of tundra regeneration on landslides with time series satellite imagery. - Environmental Research Letters 15: 105020.

Walker, X. J., et al. 2021. Positive response of tree productivity to warming is reversed by increased tree density at the Arctic tundra-taiga ecotone. - Canadian Journal of Forest Research 51: 1323-1338.