

# Time-scale dependent relations of vegetation productivity with Earth Observation based proxies and climate

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Nora Linscheid, Lina M. Estupinan-Suarez, Nuno Carvalhais, Miguel Mahecha,  
Anja Rammig, Markus Reichstein

Max Planck Institute for Biogeochemistry, Jena, Germany  
TUM School of Life Sciences Weihenstephan, Technical University of Munich, Freising, Germany  
[nlinsch@bgc-jena.mpg.de](mailto:nlinsch@bgc-jena.mpg.de)

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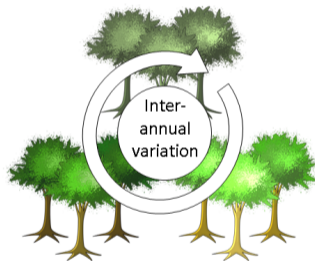
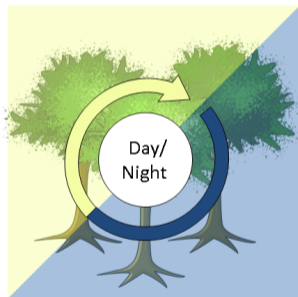


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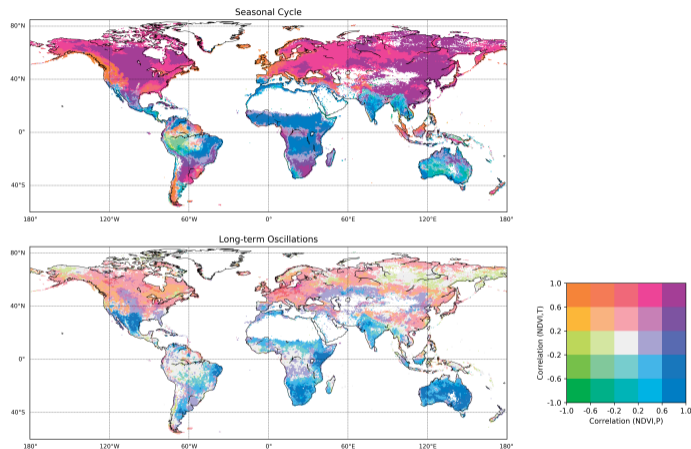
# Ecological processes act across different time scales

**Vegetation productivity** is driven by **different processes across time scales**. **Satellite proxies** of vegetation could **represent these processes differentially**, e. g. by capturing more or less short-term or inter-annual variation in gross primary productivity (GPP).



Here we **compare different Earth observation (EO) proxies** across monthly, seasonal and inter-annual time scales and find that **their relations differ between time scales**.

# Relations between vegetation and climate differ across time scales



**Figure:** Correlation of NDVI with  $T_{air}$  and Prec at seasonal (top) and longer-term time scales (bottom). Color scale represents both correlations at the same time. Data: GIMMS NDVI, 1982–2015, 14-daily,  $0.5^\circ$  resolution. For method and details see [DOI:10.5194/bg-17-945-2020](https://doi.org/10.5194/bg-17-945-2020).

**Relations between vegetation and climate** differ between seasonal (top) and inter-annual to longer-term scale (bottom).

The **sign of correlation** can even **invert between time scales**. (see e. g. southern Africa)

We find that **relations between newer vegetation proxies** such as GPP, SIF and NIRv also change between time scales, indicating that they capture different information at each scale.

## Relevance

**Prediction of long-term vegetation productivity** should take into account **varying relations** of vegetation proxies and climate across time scales.