BRC Science Highlight
February 2020

Radiance-Based NIR_V as a Proxy for GPP of Corn and Soybean

Background/objective

Accurate quantification of terrestrial photosynthesis is essential to understanding the global carbon cycle. However, existing process-based models are highly complex, and empirical models carry high levels of uncertainty. Here, researchers address the need for an effective and parsimonious method of gross primary productivity (GPP) estimation by evaluating the performance of a new proxy, $NIR_{V,Rad}$, against the established $NIR_{V,Ref}$, EVI, and SIF proxies for GPP.

Approach

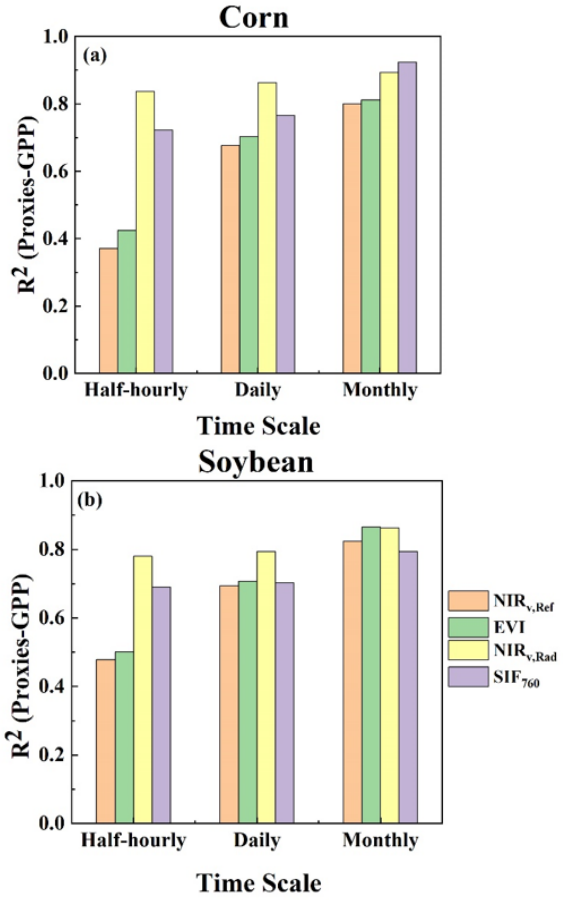
- $NIR_{v,Ref}$, $NIR_{v,Rad}$, SIF, and EVI were calculated using data collected at three agricultural sites in the U.S. Corn Belt for a total of four and three crop-years for corn and soybean, respectively.
- GPP was estimated based on eddy covariance data.
- The relationships between the four proxies and GPP were investigated.

Results

- At short (sub-daily and daily) time scales, $NIR_{V,Rad}$ exhibits greater correlation with GPP than $NIR_{V,Ref}$ and EVI, but they perform similarly at a monthly time scale.
- The $NIR_{V,Rad}$ - GPP relationships for corn and soybean are site-independent in the U.S. Corn Belt.
- The slope of the $NIR_{V,Rad}$ - GPP relationship is higher for corn than soybean.

Significance

$NIR_{V,Rad}$ -based models have great potential to estimate crop GPP at short time scales with high-resolution or long-term satellite remote sensing data. This tool will allow for more accurate GPP estimates and provide a more complete view of carbon cycling.



The $NIR_{v\text{-}Ref}$ – GPP relationship varied with time scale for both corn and soy, while $NIR_{v\text{-}Rad}$ –GPP relationship was consistently high across all time scales for both crops.

Wu et al. 2020. "Radiance-Based NIRv as a Proxy for GPP of Corn and Soybean." ***Environmental Research Letters.*** DOI:10.1088/1748-9326/ab65cc

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