



# Status of MODIS & VIIRS LAI/FPAR Products

(2022 NASA Land Discipline Team Virtual Workshop, Apr 11-12)

## Product Suite

### MODIS LAI/FPAR Product suite

- Terra (MOD), Aqua (MYD), and Terra and Aqua (MCD)
- 8 days for MOD/MYD, 4 days for MCD
- 500m
- LAI (FPAR) Validation at stage 2 (1)

### VIIRS LAI/FPAR Product suite

- VNP15A2H
- 8 days
- 500m
- LAI & FPAR Validation at stage 1

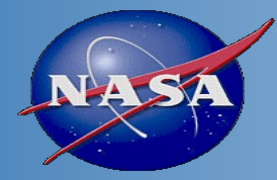
## Publications

### Algorithm & Product Evaluation

- Yan et al., 2021. Performance stability of the MODIS and VIIRS LAI algorithms inferred from analysis of long time series of products. Remote Sensing of Environment, doi: 10.1016/j.rse.2021.112438
- Yan et al., 2021. A Bibliometric Visualization Review of the MODIS LAI/FPAR Products from 1995 to 2020. Journal of Remote Sensing, doi: 10.1109/TGRS.2021.3064018
- Pu et al., 2020. Evaluation of the MODIS LAI/FPAR Algorithm Based on 3D-RTM Simulations: A Case Study of Grassland. Remote Sens., doi:10.3390/rs12203391
- Xu et al., 2020. Improving leaf area index retrieval over heterogeneous surface mixed with water. Remote Sens. Environ., doi:10.1016/j.rse.2020.111700

### Science

- Cortes et al., 2021. Where are Global Vegetation Greening and Browning Trends Significant? Geophys. Res. Lett., doi: 10.1029/2020GL091496
- Zhu et al., 2021. Comment on “Recent global decline of CO<sub>2</sub> fertilization effects on vegetation photosynthesis”. Science, doi: 10.1126/science.abg5673
- Yan et al., 2021. Modeling the radiation regime of a discontinuous canopy based on the stochastic radiative transport theory: Modification, evaluation and validation. Remote Sens. Environ., doi: 10.1016/j.rse.2021.112728



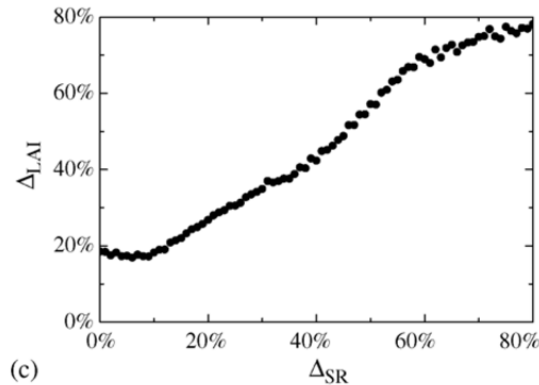
# Status of MODIS & VIIRS LAI/FPAR Products

(2022 NASA Land Discipline Team Virtual Workshop, Apr 11-12)

## Current & Planned Activities

### Impact of Sensor Drift:

- Product discontinuity will become severe when SZA is greater than 60°. This could be around when Aqua crossing times are past 4 PM.
  - The LAI product is less impacted because the geometry is an input and accounted for.
  - The FPAR product has a natural daytime variation and methods to suppress this are being studied and built into the algorithm either via minor code changes and/or changes to LUTs.
- Uncertainties in upstream SR products (and to a lesser extent the Biome map) impact retrieval quality of LAI and FPAR. This is being studied. We use “LAI precision vs SR precision” curve to quantify the propagation (Fig. below; Tan et al., Agric. For. Meteorol.,135: 124-134 2006).



### VIIRS Research:

Our VIIRS activities are geared towards operational generation of C2 LAI/FPAR products from SNPP (2012-2024) and JPSS1 (2018-2024) data that are consistent with the MODIS products. Specific proposed tasks are: (a) algorithm maintenance and SIPS implementation, (b) C2 product error and uncertainty analyses, (c) project activities and (d) scientific research with C2 products.

### Multi-Decadal Time Series Products:

Developing a single time series of LAI & FPAR products by pooling best quality retrievals from MODIS (Terra & Aqua) and VIIRS and applying simple techniques to remove outliers and gap-fill. This time series will be extended to JPSS products and will be useful for monitoring global vegetation.