

MODIS Leaf Area Index (LAI) and Fraction of Photosynthetically Active Radiation (FPAR) – Moderate Resolution (MOD 15)

Product Description

The MOD 15 Leaf Area Index (LAI) and Fraction of Photosynthetically Active Radiation absorbed by vegetation (FPAR) are 1-km at-launch products provided on a daily and 8-day basis. LAI defines an important structural property of a plant canopy, namely the one-sided leaf area per unit ground area. FPAR measures the proportion of available radiation in the photosynthetically active wavelengths (400 to 700 nm) that a canopy absorbs. The LAI product will be a LAI value between 0 and 8 of the global gridded database at the corresponding modified vegetation index (MVI) compositing interval. The FPAR product will be an FPAR value between 0.0 and 1.0 assigned to each 1-km cell of the global gridded database at the corresponding MVI compositing interval.

Research and Applications

LAI and FPAR are biophysical variables that describe canopy structure and are related to functional process rates of energy and mass exchange. Both LAI and FPAR have been used extensively as satellite-derived parameters for calculation of surface photosynthesis, evapotranspiration, and NPP. These products are essential in calculating terrestrial energy, carbon, water-cycle processes, and biogeochemistry of vegetation. The LAI product is an input to Biome-BGC (Biogeochemical) models to produce conversion-efficiency coefficients, which are combined with the FPAR product to produce daily terrestrial PSN (photosynthesis) and annual NPP.

Data Set Evolution

This product is derived from the Surface Reflectance Product (MOD 09), the Land Cover Type product (MOD 12), and ancillary information on surface characteristics such as land cover type and background. The retrievals are performed by comparing observed and modeled surface reflectances for a suite of canopy structures and soil patterns that covers a range of expected natural conditions. All canopy/soil patterns for which the magnitude of the residuals in the compari-

son does not exceed uncertainties in observed and modeled surface reflectances are treated as acceptable solutions. For each acceptable solution, a value of FPAR is also evaluated. The mean and dispersion values of the LAI solution distribution function are taken as the retrieved LAI accuracy; likewise for FPAR. A three-dimensional formulation of the radiative transfer is used to derive spectral and angular biome-specific signatures of vegetation canopies. Should this main algorithm fail, a back-up algorithm is triggered to estimate LAI and FPAR using a Normalized Difference Vegetation Index (NDVI).

Suggested Reading

- Knyazikhin, Y. *et al.*, 1998a.
- Knyazikhin, Y. *et al.*, 1998b.
- Myneni, R.B. *et al.*, 1997b.
- Tian, Y. *et al.*, 2000.
- Zhang, Y. *et al.*, 2000.

MODIS LAI and FPAR – Moderate Resolution Summary

Coverage: Global

Spatial/Temporal Characteristics: 1 km/daily, 8-day

Key Science Applications: Biogeochemical cycle modeling, NPP estimation

Key Geophysical Parameters: Leaf area index, fraction of photosynthetically active radiation absorbed by vegetation

Processing Level: 4

Product Type: Standard, at-launch

Maximum File Size: 5.8 MB

File Frequency: 289/day (Daily Level 4), 289/8-day (8-day Level 4)

Primary Data Format: HDF-EOS

Additional Product Information:

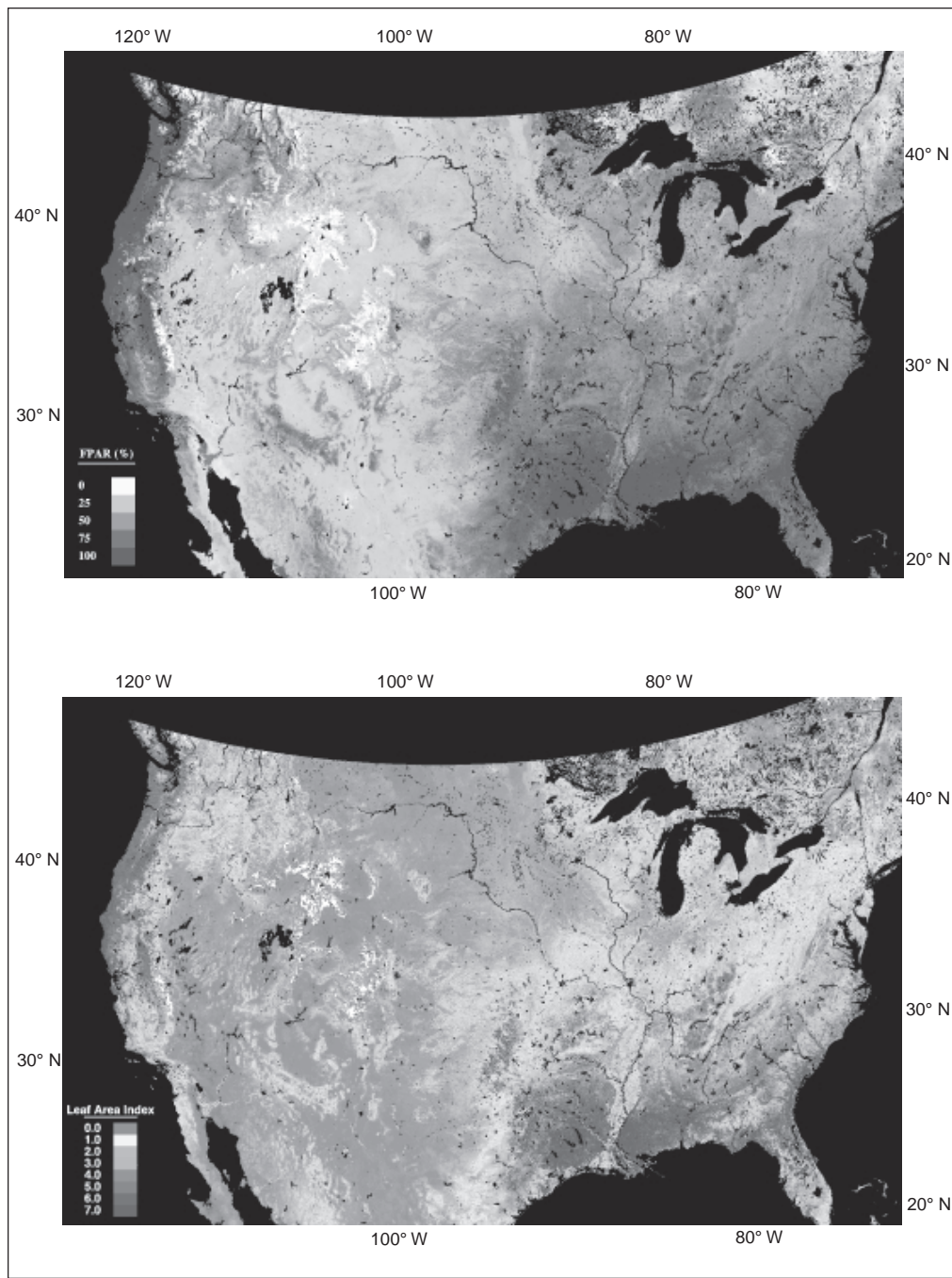
<http://modis-land.gsfc.nasa.gov/products/products.asp?ProdFamID=5>

DAAC: EROS Data Center

Science Team Contacts:

R.B. Myneni

S.W. Running



The First Complete Continental Computation of Two MODIS Land Products, Leaf Area Index (LAI) and Fraction of Absorbed Photosynthetically Active Radiation (FPAR). Both of these variables quantify green vegetation but in different ways. LAI defines canopy leaf area, while FPAR defines the amount of incoming solar radiation absorbed by the plant canopies. These variables are used to parameterize terrestrial vegetation for global carbon, hydrologic, and climate models, and also are used for a number of land management applications. This image is a time composite from March 24 to April 9, 2000, using MODIS Spectral Channels 1 and 2 at 250 m rescaled to 1 km spatial resolution. The image shows that in this early spring time period, most agricultural land and deciduous forest does not yet show spring leaf growth. Continental greening will occur rapidly over the next 4-6 weeks.