ORNL DAAC
DISTRIBUTED ACTIVE ARCHIVE CENTER
FOR BIOGEOCHEMICAL DYNAMICS

NASA

🏠 | About | Get Data | Submit Data | Tools | Resources | Help | → Sign in

Search ORNL DAAC | 🔍 Search

# Aggregate, woody and herbaceous leaf area index for Africa

**Get Data**

Documentation Revision Date: 2024-01-24

Dataset Version: 1

## Summary

This dataset provides leaf area index (LAI) data from Moderate Resolution Imaging Spectroradiometer (MODIS) Level 4, and LAI product (MCD15A2H Version 6.1) available every 8-days at 500-m pixel size. From the native MODIS LAI, the data are processed further to generate three layers including: a smoothed and gap filled LAI layer referred to as aggregate leaf area index, denoted as LAIA, and two additional layers processed using an algorithm developed in Kahiu and Hanan (2018) to separate woody LAI (LAIW, tree and shrubs), and herbaceous LAI (LAIH, grass and forbs).

**This is a preprint dataset. The QA of the data files and this dataset documentation are in progress.**
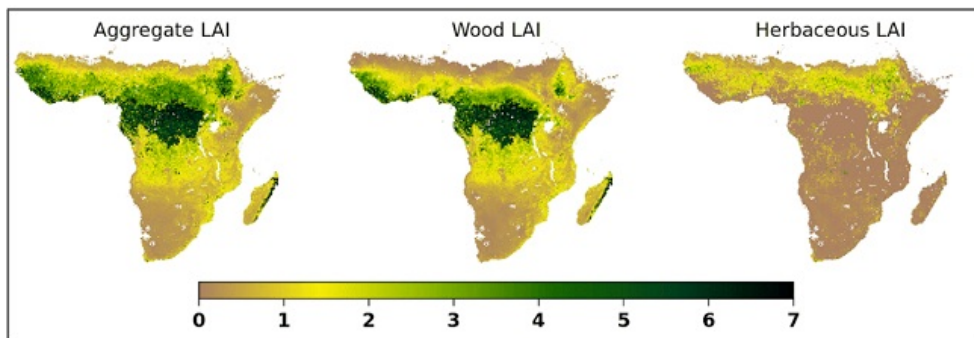


Figure 1. Leaf area index (LAI).

## Citation

Kahiu, N., and J.Y. Anchang. 2024. Aggregate, woody and herbaceous leaf area index for Africa. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2325

## Table of Contents

## 1. Dataset Overview

**Project:** **Vegetation Collection**

The ORNL DAAC compiles, archives, and distributes data on vegetation from local to global scales. Specific topic areas include: belowground vegetation characteristics and roots, vegetation biomass, fire and other disturbance, vegetation dynamics, land cover and land use change, vegetation characteristics, and NPP (Net Primary Production) data.

**Acknowledgement**

This research was funded by the NASA-SERVIR Advanced Science Team program; PEER Cycle 8, grant number 80NSSC20K0162.

## 2. Data Characteristics

**Study Areas:** Sub-Saharan Africa

**Spatial Resolution:** 500 m

**Temporal Coverage:** 2002-07-01 to 2021-12-31

**Temporal Resolution:** 8-days

**Data file information**

The data files are in NetCDF (.nc) format. The data consists of leaf area index data from Moderate Resolution Imaging Spectroradiometer (MODIS) Level 4, and Leaf Area Index (LAI) product (MCD15A2H Version 6.1) available every 8-days at 500-m pixel size. From the native MODIS LAI, the data were processed further to generate three layers including: a smoothed and gap filled LAI layer referred to as aggregate leaf area index, denoted as $LAI_A$; and two additional layers processed using an algorithm developed in Kahiu and Hanan (2018) to separate woody LAI ($LAI_W$, tree and shrubs), and herbaceous LAI ($LAI_H$, grass and forbs).

Table 1. Filenames and descriptions.

| File Name | Description |
|---|---|
| *Example:*<br>MCD15A2H.A2003001.h16v07.061.partitionedLAI.nc | MODISProduct.Date.Tile.Version.Product.FileEextension |
| Each file contains the following: | |
| 1. SmoothLAI<br>E.g.<br>MCD15A2H.A2003001.h16v07.061.smoothLAI.tif | Original MODIS LAI data after gap filling and smoothing; referred to aggregate LAI denoted as ($LAI_A$) |
| 1. WoodLAI:<br>E.g. MCD15A2H.A2003001.h16v07.061.woodLAI.tif | Separated woody LAI estimates derived from aggregate LAI denoted as ($LAI_W$) |
| 1. herbLAI<br>MCD15A2H.A2003001.h16v07.061.herbLAI.tif | Separated herbaceous LAI estimates derived from aggregate LAI denoted as ($LAI_H$) |
| ***NB***: All the files correspond to the MODIS Tiling system and Naming convention for MCD15A2H Version 6.1 | |

## 3. Application and Derivation

These data are suitable for numerous applications. By separating the effect of seasonal and long-term changes in woody and herbaceous leaf area, this product enables more precise global land surface and Earth system models. Additionally, it enhances ecological models, including those focused on fire occurrences and herbivore distribution. Furthermore, it contributes to refining estimates for drought monitoring and facilitates the development of index-based models for drought risk transfer models.

## 4. Quality Assessment

We compared MODIS partitioned LAI with *in situ* measurements, showing an overall agreement of approximately 50%. However, there's a tendency to underestimate LAIW in regions with higher in situ LAIW. These discrepancies may arise from scale differences between *in situ* data and MODIS 500 m - 1000 m pixel size, as well as limitations in the generalized allometric equations used for partitioning. To enhance accuracy, we are developing allometries that differentiate tree functional groups or bioclimatic regions. As more data on allometry models become available, we expect improved validation results in future LAI retrievals.

## 5. Data Acquisition, Materials, and Methods

The methods involved partitioning of the MODIS aggregate LAI ($LAI_A$) into separate woody ($LAI_W$) and herbaceous ($LAI_H$) constituents in both drought seasonal savannas and moist tropical forests of Sub-Saharan Africa (SSA). In our analysis, we use an allometric relationship describing the variation in peak within-canopy woody LAI of dominant tree species across precipitation gradients, coupled with independent estimates of woody canopy cover, to constrain seasonally changing woody LAI ($LAI_W$). The data covers epoch 2002 to 2021 available every 8-days at 500 m spatial resolution.

Further details on the data and processing methods are detailed in Kahiu and Hanan (2018) .

## 6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Aggregate, woody and herbaceous leaf area index for Africa

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

## 7. References

Kahiu, N., and N.P. Hanan. 2018. Estimation of Woody and Herbaceous Leaf Area Index in Sub-Saharan Africa Using MODIS Data. Journal of Geophysical Research: Biogeosciences, 123(1), 3–17. https://doi.org/10.1002/2017JG004105

OAK RIDGE
National Laboratory

**Privacy Policy | Help**

 **Home**

**About Us**
Mission
Data Use and Citation Policy
User Working Group
Partners

**Get Data**
Science Themes
NASA Projects
All Datasets

**Submit Data**
Submit Data Form
Data Scope and Acceptance
Data Authorship Policy
Data Publication Timeline
Detailed Submission Guidelines

**Tools**
TESViS
THREDDS
SDAT
Daymet
Airborne Data Visualizer
Soil Moisture Visualizer

**Resources**
Learning
Data Management
News

**Help**
Earthdata Forum 
Email Us