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Familiarisation and Visualization of Aerosol data with Hands-on-Retrieval using iAOD software

Akhilesh Kumar
PhD, UNSW, Sydney
akhilesh.kumar@unsw.edu.au

Operational AOD products

Satellite-based products	Ground-based measurements
MODIS* (DB, DT, combined, MAIAC)	AERONET*
OMI, OCM-2	ARFINET
AVHRR (1 st satellite AOD product)	ICARB
POLDER, CALIPSO	EARLINET
Landsat, Sentinel 2 ^a	ACE-1, SAFARI 2000

^aKumar, A., & Mehta, M. (2024). Global evaluation of sentinel 2 level 2A Sen2Cor aerosol optical thickness retrievals. *International Journal of Remote Sensing*, 46(2), 728–744. <https://doi.org/10.1080/01431161.2024.2421947>

Part I: Products, Access and Visualization

MODIS (DBDT & MAIAC), AERONET

MODIS Deep Blue – Dark Target (DB-DT)

LAADS DAAC

<https://ladsweb.modaps.eosdis.nasa.gov/>

Access MODIS data (LAADS DAAC)

The screenshot shows the homepage of the LAADS DAAC website (ladsweb.modaps.eosdis.nasa.gov). The page features a header with the NASA Earthdata logo and various links like 'Feedback' and 'All Bookmarks'. A prominent banner on the left side displays a stack of server units, a laptop, and clouds, symbolizing data storage and distribution. To the right of the banner is a large, semi-transparent box containing the text: 'LAADS DAAC Migrates to the Cloud' and 'Learn more.' An orange arrow points from this text towards the bottom right of the page. Below the banner, the text 'Your Source for Level-1 and Atmospheric Data' and 'Providing Access to Global Science Data Projects' is visible. At the bottom, there are six colored boxes labeled 'Missions', 'Level 0 & 1', 'Atmosphere', 'Airborne', 'Land', and 'Applications', each with a corresponding icon.

ladsweb.modaps.eosdis.nasa.gov

Apps YouTube Maps News Gmail Useful Websites - A... GEOG-422/510 Open Source Books GEOG-414 Email - Akhilesh Ku... Cancer Drug Interac... All Bookmarks

NASA | EARTHDATA Other DAACs - Feedback ?

LAADS DAAC Level-1 and Atmosphere Archive & Distribution System Distributed Active Archive Center

About LAADS Data Learn Login

LAADS DAAC Migrates to the Cloud Learn more.

Your Source for Level-1 and Atmospheric Data

Missions Level 0 & 1 Atmosphere Airborne Land Applications

Access MODIS data ...

ladsweb.modaps.eosdis.nasa.gov/search/

LAADS DAAC

1 PRODUCTS 2 TIME 3 LOCATION 4 FILES 5 REVIEW & ORDER

No products selected. No date selected. No location selected. No files selected.

All Sensors

All Standard Collections

All [531]
Level-0 / Level-1 [32]
MODIS Terra, Aqua [12]
VIIRS Suomi NPP [9]
OLCI ESA Copernicus Sentinel-3A [2]
SLSTR ESA Copernicus Sentinel-3A [1]
OLCI ESA Copernicus Sentinel-3B [2]
SLSTR ESA Copernicus Sentinel-3B [1]
MERIS Envisat [5]

Atmosphere [78]
Aerosol [33]
Water Vapor [5]
Cloud Properties [20]
Atmosphere Profiles [2]
Cloud Mask [6]
L2 Joint Atmosphere Product [2]
L3 Atmosphere Product [8]
VIIRS+CrlS Fusion [2]
GEO-LEO Dark Target Aerosol [9]

Airborne [5]

Aerosol

AERDB_M3_GEOLEO_Merged
MODIS+AHI+ABI+VIIRS/GEO-LEO Merged Deep Blue Aerosol monthly 1x1 degree grid

AERDB_M3_VIIRS_NOAA20
VIIRS/NOAA20 Deep Blue Level 3 monthly aerosol data, 1x1 degree grid

AERDB_M3_VIIRS_SNPP
VIIRS/SNPP Deep Blue Level 3 monthly aerosol data, 1x1 degree grid

AERDT_L2_VIIRS_NOAA20
VIIRS/NOAA20 Dark Target Aerosol 6-Min L2 Swath 6 km

AERDT_L2_VIIRS_SNPP
VIIRS/SNPP Dark Target Aerosol L2 6-Min Swath 6 km

MOD04_3K
MODIS/Terra Aerosol 5-Min L2 Swath 3km

MOD04_L2
MODIS/Terra Aerosol 5-Min L2 Swath 10km

MYD04_3K
MODIS/Aqua Aerosol 5-Min L2 Swath 3km

MYD04_L2
MODIS/Aqua Aerosol 5-Min L2 Swath 10km

XAERDT_L2_ABI_G16
ABI/GOES-16 Dark Target Aerosol 10-Min L2 Full Disk 10 km

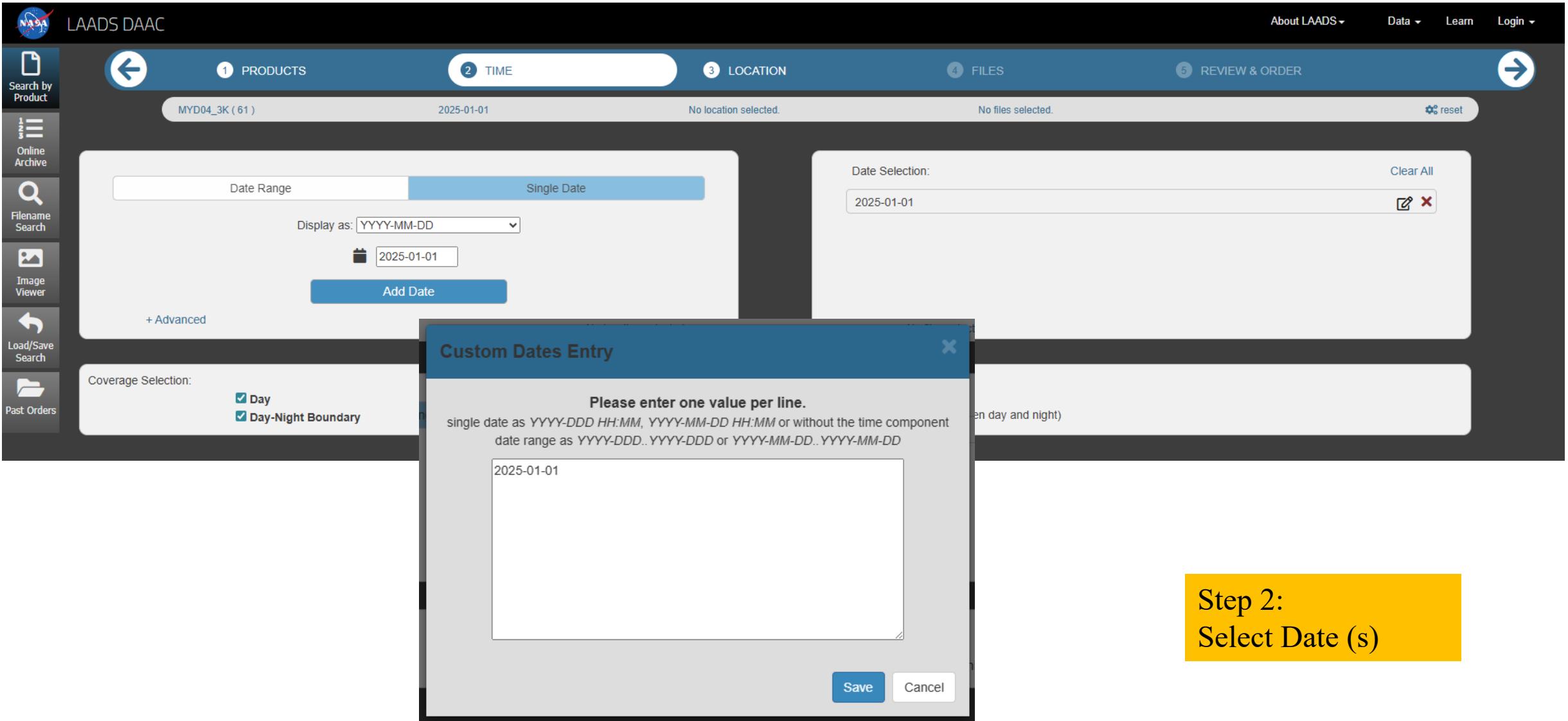
XAERDT_L2_ABI_G17
ABI/GOES-17 Dark Target Aerosol 10-Min L2 Full Disk 10 km

XAERDT_L2_ABI_H08

**Step 1:
Select Product (s)**

The screenshot shows the LAADS DAAC search interface. A red box highlights the browser's address bar with the URL 'ladsweb.modaps.eosdis.nasa.gov/search/'. The main search area has tabs for PRODUCTS, TIME, LOCATION, FILES, and REVIEW & ORDER. The PRODUCTS tab is active. On the left, there are dropdown menus for 'All Sensors' and 'All Standard Collections'. The 'Aerosol' section is expanded, showing various datasets. Two specific datasets are highlighted with a red box: 'MOD04_3K' and 'MYD04_3K'. A yellow box labeled 'Step 1: Select Product (s)' is overlaid on the right side of the page.

Access MODIS data ...



The screenshot shows the LAADS DAAC search interface with the 'TIME' step selected. The main interface displays a date range from 2025-01-01 to 2025-01-01, with no location selected and no files selected. A modal window titled 'Custom Dates Entry' is open, prompting for date input. The date '2025-01-01' is entered in the text area. The 'Save' button is visible at the bottom right of the modal.

Custom Dates Entry

Please enter one value per line.
single date as YYYY-DDD HH:MM, YYYY-MM-DD HH:MM or without the time component
date range as YYYY-DDD..YYYY-DDD or YYYY-MM-DD..YYYY-MM-DD

2025-01-01

Save Cancel

**Step 2:
Select Date (s)**

Access MODIS data ...

Step 3: Select Location (s) Using Validation Sites



Access MODIS data ...

Step 3: Select Location (s)
Using a bounding box

The screenshot shows the LAADS DAAC search interface. At the top, there is a navigation bar with the NASA logo, 'LAADS DAAC', and links for 'About LAADS', 'Data', 'Learn', and 'Login'. Below the navigation bar is a search bar with tabs for 'PRODUCTS', 'TIME', 'LOCATION' (which is highlighted in yellow), 'FILES', and 'REVIEW & ORDER'. The search results for 'MYD04_3K (61)' from '2025-01-01' are displayed, showing coordinates 'W: 64.8°, N: 37.2°, E: 97.5°, S: 4.5°' and a message 'No files selected.' A 'reset' button is also present.

On the left side, there is a vertical sidebar with icons for 'Search by Product', 'Online Archive', 'Filename Search', 'Image Viewer', 'Load/Save Search', and 'Past Orders'. The main area features a world map with a bounding box selection tool. An orange box highlights a region over India and the Middle East. A blue box highlights a region over Africa. A legend on the right, titled 'SELECT AREA OF INTEREST', provides options for 'World', 'Countries', 'Validation Sites', and 'Draw Custom Box (Classic)'. It also includes a 'Enter Coordinates' section with the current selection: 'W: 64.8°, N: 37.2°, E: 97.5°, S: 4.5°'.

Access MODIS data ...

Step 4: Select File (s)

LAADS DAAC

About LAADS ▾ Data ▾ Learn Login ▾

1 PRODUCTS 2 TIME 3 LOCATION 4 FILES 5 REVIEW & ORDER

MYD04_3K (61) 2025-01-01 W: 66°, N: 37.7°, E: 98°, S: 4.2° 7 files selected reset

* Download selected files as json or CSV

Search: Showing 1 to 7 of 7 entries Select All Clear All

Filename	Product (collection)	Date / Time	Download
MYD04_3K.A2025001.1020.061.2025002235307.hdf	MYD04_3K (61)	2025-01-01 10:20:00	14 MB
MYD04_3K.A2025001.0840.061.2025002235451.hdf	MYD04_3K (61)	2025-01-01 08:40:00	9 MB
MYD04_3K.A2025001.1025.061.2025002235221.hdf	MYD04_3K (61)	2025-01-01 10:25:00	8 MB
MYD04_3K.A2025001.0850.061.2025002235524.hdf	MYD04_3K (61)	2025-01-01 08:50:00	4 MB
MYD04_3K.A2025001.0705.061.2025002235525.hdf	MYD04_3K (61)	2025-01-01 07:05:00	9 MB
MYD04_3K.A2025001.0845.061.2025002235508.hdf	MYD04_3K (61)	2025-01-01 08:45:00	15 MB
MYD04_3K.A2025001.0710.061.2025002235925.hdf	MYD04_3K (61)	2025-01-01 07:10:00	6 MB

Query Results Selected (7)

Search by Product Online Archive Filename Search Image Viewer Load/Save Search Back Orders

Access MODIS data ...

Step 5: Review and Order

The screenshot shows the LAADS DAAC interface for ordering MODIS data. The top navigation bar includes links for About LAADS, Data, Learn, and Login. On the left, a sidebar provides links for Search by Product, Online Archive, Filename Search, Image Viewer, Load/Save Search, and Past Orders. The main workflow steps are labeled 1 PRODUCTS, 2 TIME, 3 LOCATION, 4 FILES, and 5 REVIEW & ORDER. Step 5 is currently active, showing a summary of the order: MYD04_3K (Collection 61) from 2025-01-01 at W: 66°, N: 37.7°, E: 98°, S: 4.2°, resulting in 7 files selected. A note indicates the order will generate 7 files. To the right, the Post-Processing Parameters section allows selecting parameters like SDS, Geo, Mosaic, Reformat, Reproject, and Control. Under SDS Info, it says "Please select one or more parameters to be included in the subset order". A list of parameters includes Aerosol_Cloud_Fraction_Land and Aerosol_Cloud_Fraction_Ocean. A red "Cancel Post-Processing" button is visible. Below this is a "View Delivery Method" section showing "Delivery method: HTTP GET" and "Stage products where I can download them using GNU Wget". At the bottom, a note states "The order may generate as many as 7 files." and there are "Add another search" and "Submit Order" buttons.

- Metadata (sds)
- Georeference (Geo)
- Combine multiple files (Mosaic)
- Different file formats (Reformat)
- Reproject

...and lots of other options.

Access MODIS data ...

Step 6: Download



LAADS Web Order Notification ➔ Inbox



v2lads <noreply@nasa.gov>
to me ▾

10:40 AM (0 minutes ago)

Your Export ID is: 502424881

The data you ordered will be staged (in about 10 minutes), and you can retrieve the data through HTTP using GNU wget, as follows

```
wget -e robots=off -m -np -R .html,.tmp -nH --cut-dirs=3  
https://ladsweb.modaps.eosdis.nasa.gov/archive/orders/502424881/  
-header "Authorization: Bearer <YOUR_EDL_TOKEN>" -P <target dir>
```



Using Command Terminal

Replace the <YOUR_EDL_TOKEN> placeholder with your Earthdata Login token. EDL tokens can be created and retrieved by logging into your Earthdata account and selecting "Generate Token" from the menu.

Replace the <target dir> placeholder with the directory where you wish to save the files.

Explanation of additional options used:

- e robots=off : Bypass the robots.txt file, to allow access to all files in the order
- m : Enable mirroring options (-r -N -l inf) for recursive download, timestamping & unlimited depth
- np : Do not recurse into the parent location
- R .html,.tmp : Reject (do not save) any .html or .tmp files (which are extraneous to the order)
- nH : Do not create a subdirectory with the Host name (ladsweb.modaps.eosdis.nasa.gov)
- cut-dirs=3 : Do not create subdirectories for the first 3 levels (archive/orders/502424881)
- header : Adds the header with your appKey (which is encrypted via SSL)
- P : Specify the directory prefix (may be relative or absolute)

If you do not have wget:

- Windows users can download it at <https://eternallybored.org/misc/wget/>
- Mac OS X users can install it using Homebrew (<https://brew.sh>) using the command `brew install wget`
- Additional information on wget is available at <https://www.gnu.org/software/wget/faq.html>

Alternatively, you can use an HTTP script from

<https://ladsweb.modaps.eosdis.nasa.gov/tools-and-services/data-download-scripts/>

or manually download all files from

<https://ladsweb.modaps.eosdis.nasa.gov/archive/orders/502424881/>

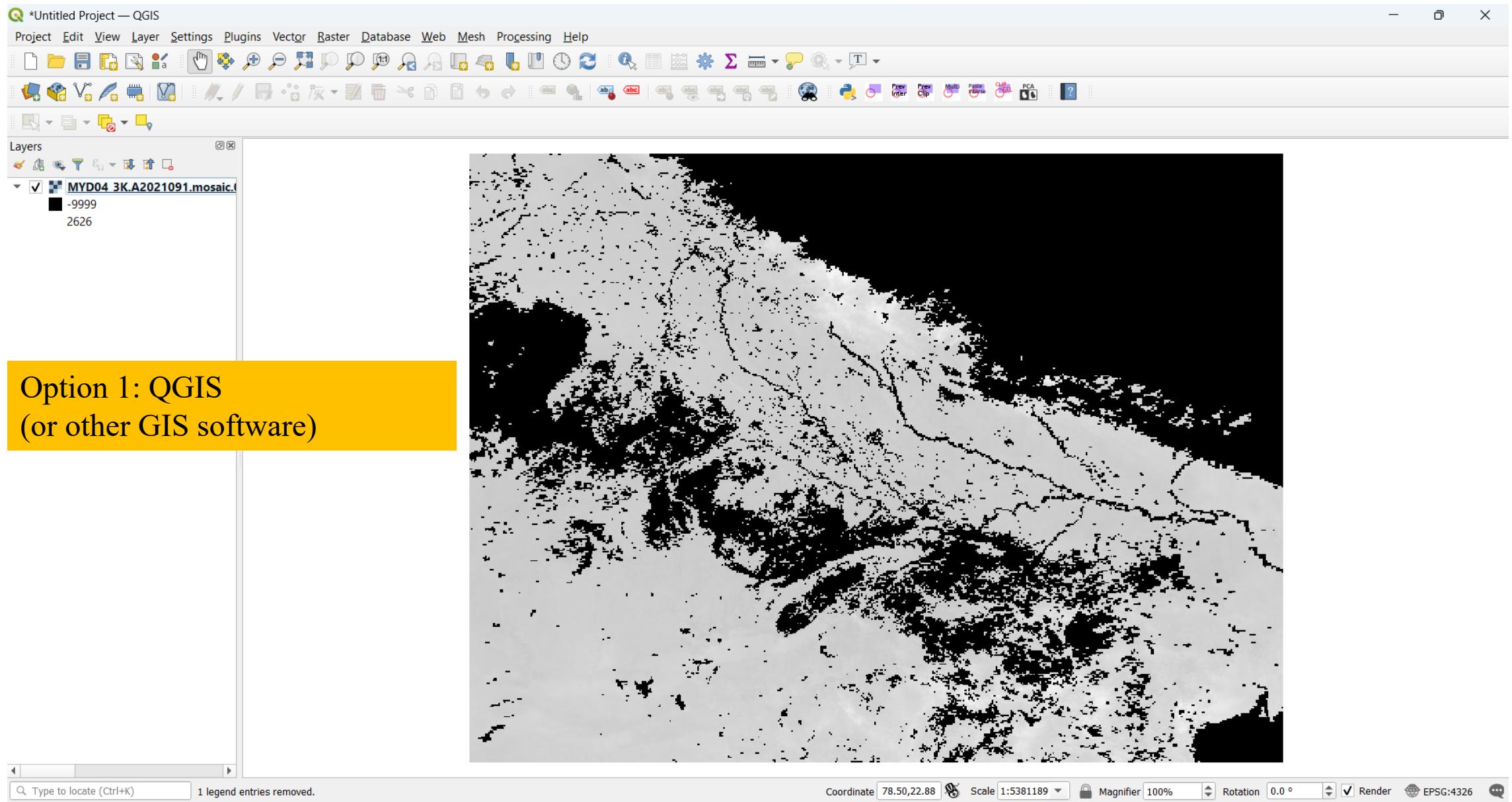


Using HTTP scripts (site crawl)



Manual

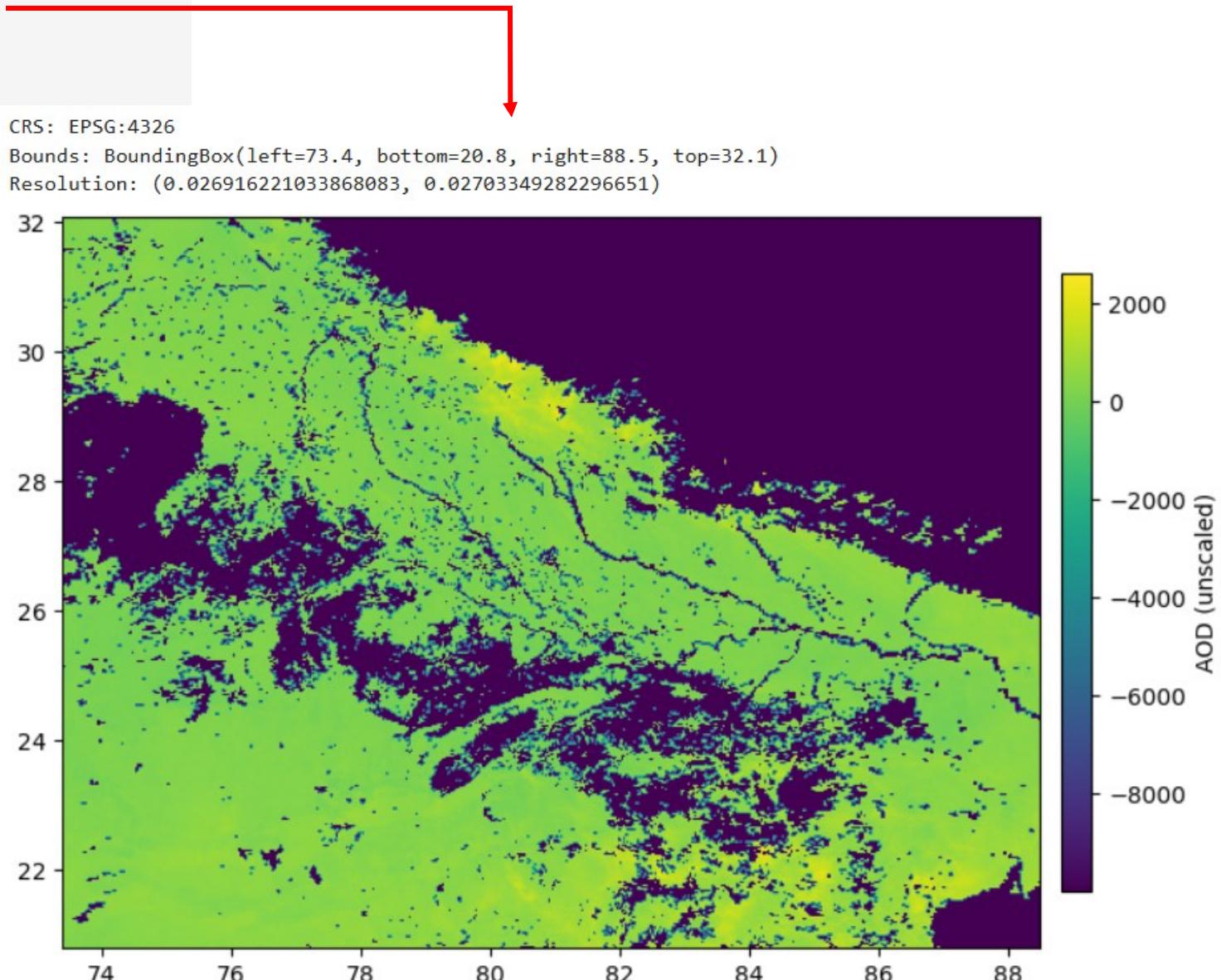
Visualizing MODIS data



Visualizing MODIS data ...

```
1 import rasterio
2 from rasterio.plot import show
3 import matplotlib.pyplot as plt
4
5 def display_geotiff(path):
6
7     with rasterio.open(geotiff_path) as src:
8         data = src.read(1) # first band
9         print("CRS:", src.crs)
10        print("Bounds:", src.bounds)
11        print("Resolution:", src.res)
12
13    fig, ax = plt.subplots(figsize=(8, 8))
14    img = show(data, transform=src.transform, ax=ax, cmap="viridis")
15
16    cbar = plt.colorbar(img.get_images()[0], ax=ax, fraction=0.04)
17    cbar.set_label("AOD (unscaled)") # label for legend
18    plt.show()
19
20
21 # Example
22 geotiff_path = r"D:\Aerosol Modelling\Validation_Data\MYD04_3K\MYD04_3K.tif"
23 display_geotiff(geotiff_path)
```

Option 2: Programming Language
(Python (shown above), R, etc.)



Multi-angle Implementation of Atmospheric Correction (MAIAC)

Google Earth Engine

[https://developers.google.com/earth-
engine/datasets/catalog/MODIS_061_MCD19A2_GRANULES](https://developers.google.com/earth-engine/datasets/catalog/MODIS_061_MCD19A2_GRANULES)

Access MAIAC data ...

ata Catalog

Search

All datasets

All tags

Landsat

MODIS

Sentinel

Publisher

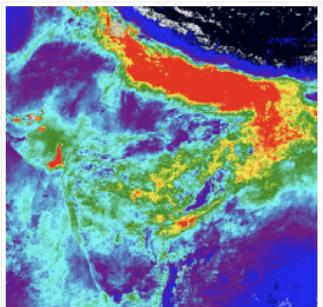
Community

API Docs

Dataset status

MCD19A2.061: Terra & Aqua MAIAC Land Aerosol Optical Depth Daily 1km

AI-generated Key Takeaways



Dataset Availability

2000-02-24T00:00:00Z–2025-11-20T23:55:00Z

Dataset Provider

NASA LP DAAC at the USGS EROS Center

Earth Engine Snippet

```
ee.ImageCollection("MODIS/061/MCD19A2_GRANULES")
```

Cadence

1 Day

Tags

aerosol
usgs

```
1 import ee
2
3 if not ee.data._credentials:
4     ee.Authenticate()
5 if not ee.data._initialized:
6     ee.Initialize(project='[REDACTED]')
7
8 bbox = ee.Geometry.BBox(73.4, 20.8, 88.5, 32.1)
9 collection = (ee.ImageCollection("MODIS/061/MCD19A2_GRANULES")
10     .filterBounds(bbox)
11     .filterDate("2023-01-01", "2023-01-31"))
12
13 image = collection.first()
14 image = image.select("Optical_Depth_055") # Optical depth at 550nm
15
16 image_clipped = image.clip(bbox)
17
18 # Download locally via URL
19 print("Generating download URL...")
20 url = image_clipped.getDownloadURL({"scale": 1000, # MODIS native resolution ~1km
21     "crs": "EPSG:4326", "region": bbox})
22
23 print("Download link: ", url)
```

Generating download URL...

Download link: [https://earthengine.googleapis.com/v1alpha/projects/\[REDACTED\]/thumbnails/f5be9506:getPixels](https://earthengine.googleapis.com/v1alpha/projects/[REDACTED]/thumbnails/f5be9506:getPixels)

Data on: Google Earth Engine
Access: Python (earthengine-api)

Visualizing MAIAC data ...

```
import ee
import folium
import geemap

if not ee.data._credentials:
    ee.Authenticate()
if not ee.data._initialized:
    ee.Initialize(project='[REDACTED]')

bbox = ee.Geometry.BBox(73.4, 20.8, 88.5, 32.1)

collection = (ee.ImageCollection("MODIS/061/MCD19A2_GRANULES")
    .filterDate("2023-05-01", "2023-05-15")
    .filterBounds(bbox))

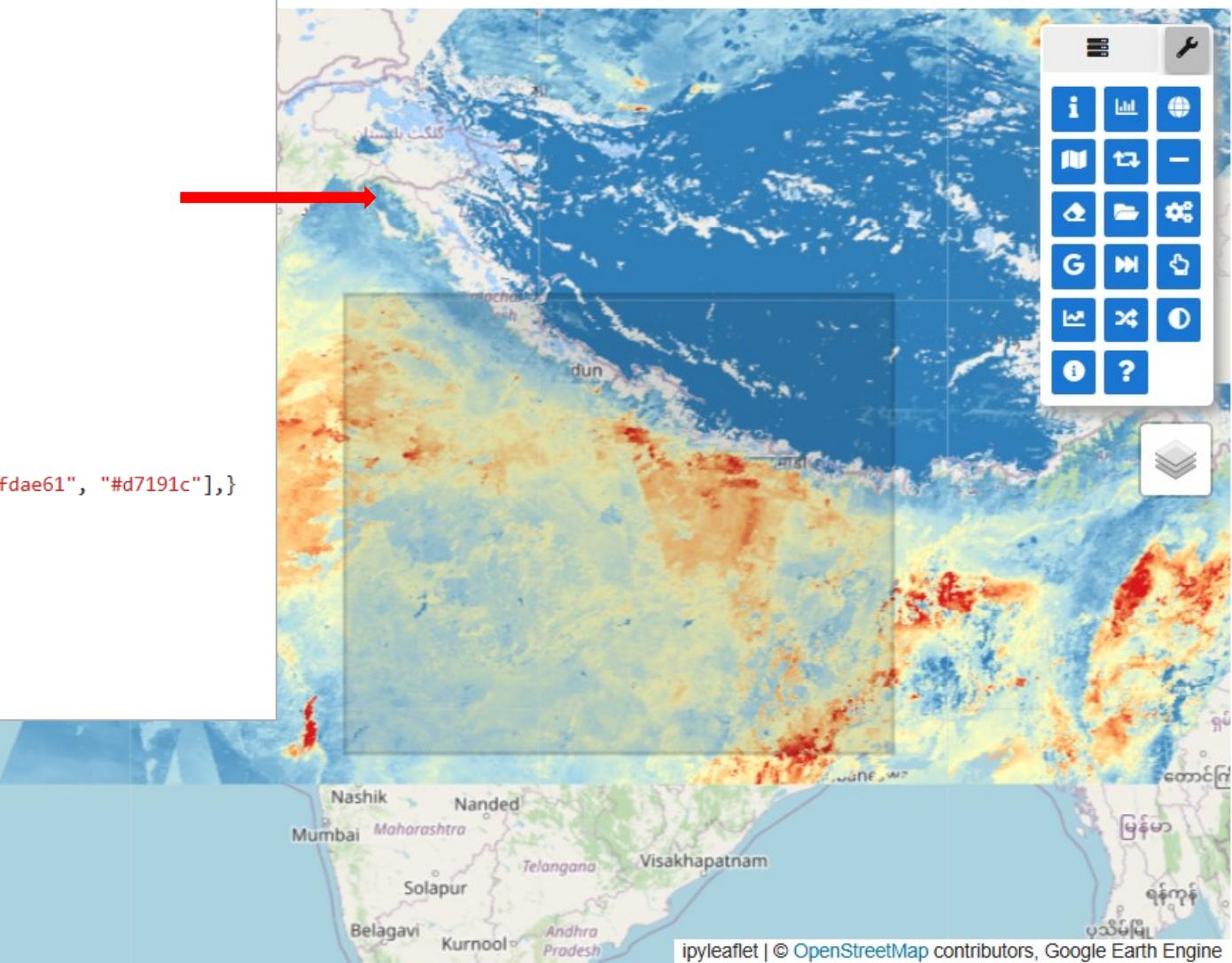
mosaic = collection.mosaic()
aod = mosaic.select("Optical_Depth_055").multiply(0.001)

vis_params = {"min": 0, "max": 1.5, "palette": ["#2c7bb6", "#abd9e9", "#ffffbf", "#fdbe61", "#d7191c"],}
m = geemap.Map(center=[26.5, 80], zoom=5)
m.addLayer(aod, vis_params, "MCD19A2_GRANULES AOD Mosaic")

bbox_fc = ee.FeatureCollection([ee.Feature(bbox)])
m.addLayer(bbox_fc, {"color": "black"}, "Bounding Box")

m.addLayerControl()
m
```

Python (earthengine-api, geemap)



ipyleaflet | © OpenStreetMap contributors, Google Earth Engine

Access/Visualize Sentinel 2 data ...

Harmonized Sentinel-2 MSI: MultiSpectral Instrument, Level-2A (SR)

◆ Page Summary ▼



Dataset Availability
2017-03-28T00:00:00Z–2025-12-16T22:49:35.914000Z

Dataset Provider
[European Union/ESA/Copernicus](#)

Earth Engine Snippet
`ee.ImageCollection("COPERNICUS/S2_SR_HARMONIZED")`

Image collection:
COPERNICUS/S2_SR_HARMONIZED

Band:
AOT

Aerosol Robotic Network (AERONET)

NASA AERONET

<https://aeronet.gsfc.nasa.gov/>

Access AERONET data (website)

The screenshot shows the AERONET website homepage. At the top, there's a banner with the text "AERONET" and "AEROSOL ROBOTIC NETWORK" next to an image of a sun photometer. Below the banner is a horizontal menu bar with five items: "+ AEROSOL OPTICAL DEPTH", "+ AEROSOL INVERSIONS", "+ SOLAR FLUX", "+ OCEAN COLOR", and "+ MARITIME AEROSOL". A yellow callout box below the menu contains the text: "For receiving updates on AERONET - subscribe to the mailing list by sending an email to aeronet-join@lists.nasa.gov". To the left of the main content area is a sidebar with a dark blue header "Home" and a list of links under "+ DATA", "+ LOGISTICS", "+ NASA PROJECTS", "+ OPERATIONS", "+ PUBLICATIONS", "+ SITE INFORMATION", "+ STAFF", and "+ SYSTEM DESCRIPTION". Below this is another section titled "AERONET DATA ACCESS" with links for "DATA VISUALIZATION" (including "Synergy Tool", "Map Explorer", "Air Quality", and "Diurnal Analysis") and "AEROSOL OPTICAL DEPTH (V3)-SOLAR" (including "Data Display" and "Download Tool"). The "Download Tool" link is highlighted with a red border. The main content area features a world map showing the locations of AERONET sites, with green dots representing solar flux and other colored dots representing aerosol optical depth. The date "2025-11-28" is displayed above the map. To the right of the map is a section titled "About AERONET" which provides a detailed description of the program's history and objectives.

<https://aeronet.gsfc.nasa.gov/>

AERONET Data Access

Aerosol Optical Depth (V3) - Solar

Download Tool

Access AERONET data

Step 1: Select site

Step 2:
Select date & product (s)

+Home

Aerosol Optical Depth

+ AEROSOL/FLUX NETWORKS

+ CAMPAIGNS

+ COLLABORATORS

- DATA

+ LOGISTICS

+ NASA PROJECTS

+ OPERATIONS

+ PUBLICATIONS

+ SITE INFORMATION

+ STAFF

+ SYSTEM DESCRIPTION

AERONET DATA ACCESS

DATA VISUALIZATION

+ Synergy Tool

AERONET Data Download Tool Version 3 Direct Sun Algorithm

Active Status Region Selection Country/Province Selection AERONET Site

Active Asia India All Sites

Map of South Asia showing AERONET sites. A callout bubble highlights the 'Kanpur' site.

AERONET Data Download Tool Version 3 Direct Sun Algorithm

Click Geographic Region, Country/State or AERONET Site to change site selection:

Geographic Region Country/State AERONET Site

Asia India Kanpur

Download Data for Kanpur

Select the start and end time of the data download period:

START: Day/Month/Year END: Day/Month/Year

1 JAN 2025 30 JAN 2025

Data Descriptions Data Units

Note: Data are not available if the data type is *italicized*

Select the data type(s) using the corresponding check box:

Direct Sun Products		Select
Aerosol Optical Depth (AOD) with Precipitable Water and Angstrom Parameter		<input type="checkbox"/> Level 1.0 <input checked="" type="checkbox"/> Level 1.5 <input type="checkbox"/> Level 2.0
Total Optical Depth based on AOD Level*		<input type="checkbox"/> Level 1.0 <input checked="" type="checkbox"/> Level 1.5 <input type="checkbox"/> Level 2.0
Spectral Deconvolution Algorithm (SDA) Retrievals -- Fine Mode AOD, Coarse Mode AOD, and Fine Mode Fraction		<input type="checkbox"/> Level 1.0 <input type="checkbox"/> Level 1.5 <input type="checkbox"/> Level 2.0

Data Format

All Points Daily Averages Monthly Averages

Download

*All Points Format Only

Process AERONET data (manual)

File Home Insert Draw Page Layout Formulas Data Review View Help Tell me what you want to do

Get Data From Text/CSV From Web From Table/ Range Recent Sources Existing Connections Refresh All Properties Workbook Links Sort Advanced Filter Reapply Advanced

Text to Columns Flash Fill Remove Duplicates Data Validation Consolidate Data Model What-If Analysis Forecast Sheet Group Ungroup Subtotal Outline Automation

A1 AERONET Version 3

1 AERONET Version 3
2 Kanpur
3 Version 3: AOD Level 1.5
4 The following data are cloud cleared and quality controls have been applied but these data may not have final calibration applied
5 Contact: PI=S._N._Tripathi_and_Pawan_Gupta_and_Elena_Lind; PI Email=snt@iitk.ac.in_and_pawan.gupta@nasa.gov_and_elena.lind@iitk.ac.in
6 All Points UNITS can be found at https://aeronet.gsfc.nasa.gov/new_web/units.html
7 Date(dd:mm:yy) Time(hh:mm) Day_of_Year Day_of_Year AOD_1640 AOD_1020 AOD_870n AOD_865n AOD_779n AOD_675n AOD_667n /
8 24:01:2025 04:46:51 24 24.1992 0.0807 0.160587 0.210441 -999 -999 0.311822 -999
9 24:01:2025 05:00:49 24 24.2089 0.078039 0.154063 0.200244 -999 -999 0.29743 -999
10 24:01:2025 05:10:14 24 24.21544 0.082186 0.161216 0.209523 -999 -999 0.30933 -999
11 24:01:2025 05:16:51 24 24.22004 0.080435 0.154406 0.202058 -999 -999 0.299056 -999
12 24:01:2025 05:21:51 24 24.22351 0.075478 0.142722 0.187494 -999 -999 0.278726 -999
13 24:01:2025 05:26:51 24 24.22698 0.07465 0.143218 0.18868 -999 -999 0.281241 -999
14 24:01:2025 05:31:51 24 24.23045 0.077483 0.146994 0.19149 -999 -999 0.282397 -999
15 24:01:2025 05:36:51 24 24.23192 0.074772 0.140252 0.184663 -999 -999 0.274579 -999
16 24:01:2025 05:41:51 24 24.23174 0.080364 0.15143 0.198434 -999 -999 0.293266 -999
17 24:01:2025 05:51:51 24 24.24134 0.082629 0.156618 0.206234 -999 -999 0.305074 -999
18 24:01:2025 06:10:09 24 24.25105 0.072284 0.134662 0.177354 -999 -999 0.263507 -999
19 24:01:2025 06:16:51 24 24.2617 0.077222 0.142566 0.185974 -999 -999 0.274556 -999
20 24:01:2025 06:21:51 24 24.2622 0.077222 0.142566 0.190556 -999 -999 0.284198 -999
21 24:01:2025 06:26:51 24 24.2627 0.077222 0.142566 0.180966 -999 -999 0.268487 -999
22 24:01:2025 06:31:51 24 24.2632 0.077222 0.142566 0.190315 -999 -999 0.284118 -999
23 24:01:2025 06:36:51 24 24.2637 0.077222 0.142566 0.190736 -999 -999 0.283499 -999
24 24:01:2025 07:21:51 24 24.30684 0.074255 0.133386 0.175602 -999 -999 0.261927 -999
25 24:01:2025 07:26:51 24 24.31031 0.071749 0.126831 0.167782 -999 -999 0.251554 -999
26 24:01:2025 07:46:51 24 24.3242 0.074711 0.129616 0.168578 -999 -999 0.250175 -999
27 24:01:2025 07:51:51 24 24.32767 0.072293 0.124841 0.165728 -999 -999 0.247226 -999
28 24:01:2025 08:00:53 24 24.33395 0.067972 0.111719 0.150812 -999 -999 0.223298 -999
29 24:01:2025 08:10:18 24 24.34049 0.067956 0.115417 0.150049 -999 -999 0.222378 -999
20250101_20250130_Kanpur

Convert Text to Columns Wizard - Step 2 of 3

This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below.

Delimiters

Tab
 Semicolon
 Comma
 Space
 Other:
 Treat consecutive delimiters as one
Text qualifier: "

Data preview

AERONET Version 3
Kanpur
Version 3: AOD Level 1.5
The following data are cloud cleared and quality controls have been applied but these data may not have final calibration applied
Contact: PI=S._N._Tripathi_and_Pawan_Gupta_and_Elena_Lind; PI Email=snt@iitk.ac.in_and_pawan.gupta@nasa.gov_and_elena.lind@iitk.ac.in
All Points

Step 1:
Load & Format

Step 2:
Temporal averaging

Time taken: ~ 15-20 mins per site per date

Download & Process AERONET data (iAOD)

AERONET Extraction Module

AERONET Extraction

Year:	2025	Satellite Overpass Time	24-01-2025 05:15:29
Temporal Scale [For averaging, in minutes]:	60	Wavelength (in nm)	550
AERONET Data Level:	1.5		
Raster File [for extracting extent]:	Browse	D:/Aerosol Modelling/Aerosol/Scripts/GUI/Landsat 8	
Destination Folder [to save downloaded files]:	Browse	D:/Aerosol Modelling/Aerosol/Scripts/GUI/Landsat 8	

Extract AERONET AOD **View Result** **Calculate Angstrom AOD**

Output console:

```
|   | Site_Name      | lon | lat | Elevation(meters) |
|---+-----+-----+-----+-----+
| 340 | Amity_Univ_Gurgaon | 76.916 | 28.3173 | 285
| 416 | IIT_Delhi       | 77.1926 | 28.545  | 15
+---+-----+-----+-----+-----+
Processing: Fetching and averaging AERONET Level1.5 values at ±60min

File downloaded successfully from https://aeronet.gsfc.nasa.gov/cgi-bin/print_web_data_v3?site=Amity_Univ_Gurgaon&year=2025&month=1&day=24&hour=5&year2=2025&month2=1&day2=24&hour2=6&AOD15=1&AVG=10

File downloaded successfully from https://aeronet.gsfc.nasa.gov/cgi-bin/print_web_data_v3?site=IIT_Delhi&year=2025&month=1&day=24&hour=5&year2=2025&month2=1&day2=24&hour2=6&AOD15=1&AVG=10
+---+-----+-----+-----+
|   | Site Name      | AOD_440nm | AOD_1020nm | AOD_550.0nm |
|---+-----+-----+-----+-----+
| 0 | Amity_Univ_Gurgaon | 0.375297 | 0.16821  | 0.303303
| 1 | IIT_Delhi       | 0.338077 | 0.101567 | 0.245701
+---+-----+-----+-----+
```

About

Checking the availability, downloading, cleaning and pre-processing AERONET data for each station is a time consuming process. Using this module, data for all the available AERONET sites within a raster extent can be downloaded, cleaned, and averaged in less than a minute or two.

Since most AOD retrieval studies focus on temporal averaging within ± 30-60 minutes of satellite overpass time, an option has been provided to set a temporal averaging time too (default is 60 min). Satellite overpass time must be provided by the user. It is generally available in the metadata file. By default, AERONET site for year 2021 is accessed but it can be changed by the user as per their needs.

In the output file, the 'hour' value is the median time of the temporal averaging scale and is generally equal to the satellite overpass time. Since AERONET AOD is only available at certain wavelengths, once AERONET AOD has been extracted, use 'Calculate Angstrom AOD' to calculate AOD at the required wavelength.

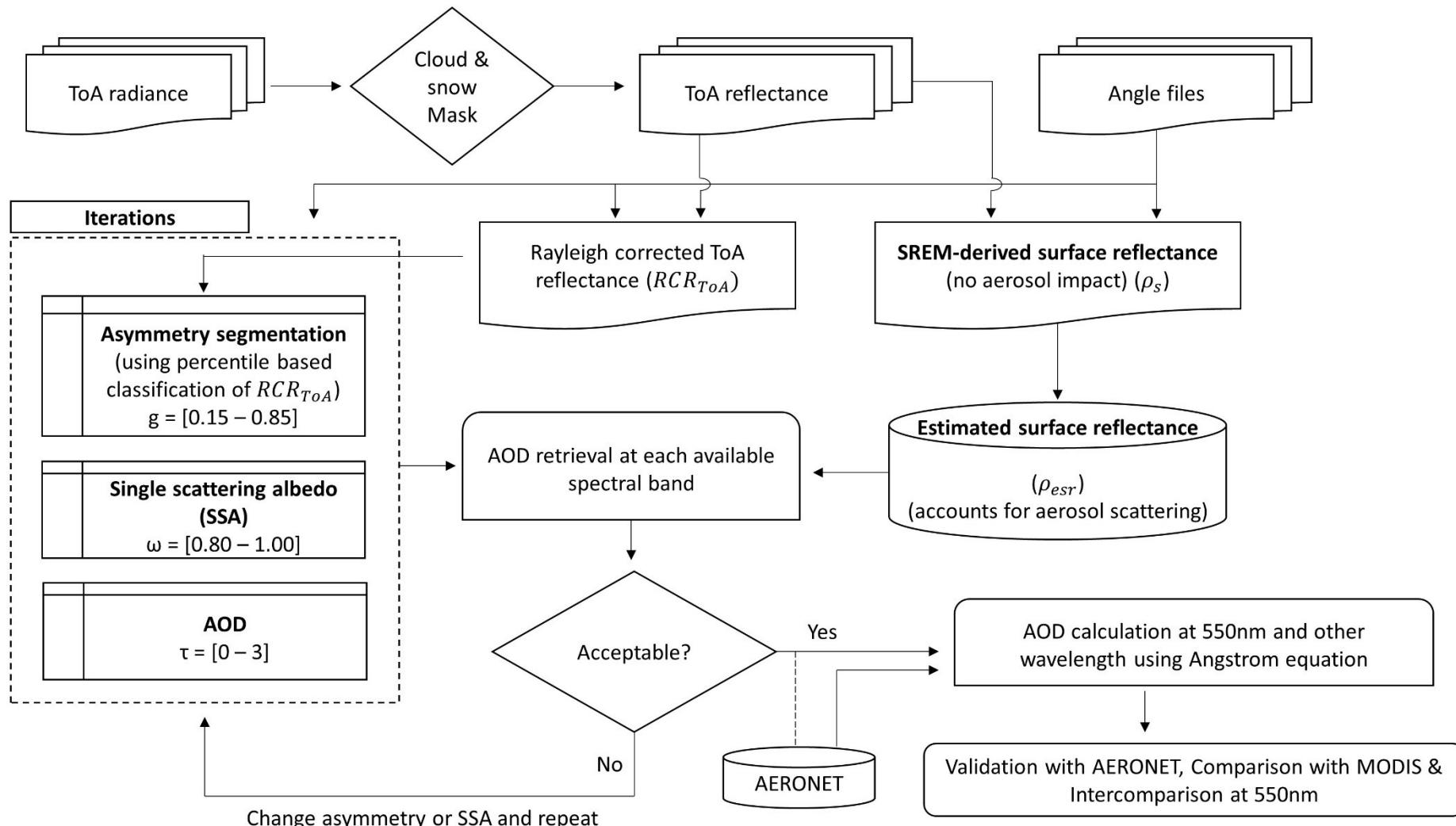
Extract AERONET AOD – Retrieve, Clean, and preprocess AERONET data

Calculate Angstrom AOD – AOD @ 550nm using AOD at 443 nm & 865 nm

Time taken: ~ 10-30 sec

Part 2: iAOD Demonstration

iAOD Methodology (Kumar & Mehta, 2023)



Automated in
iAOD software

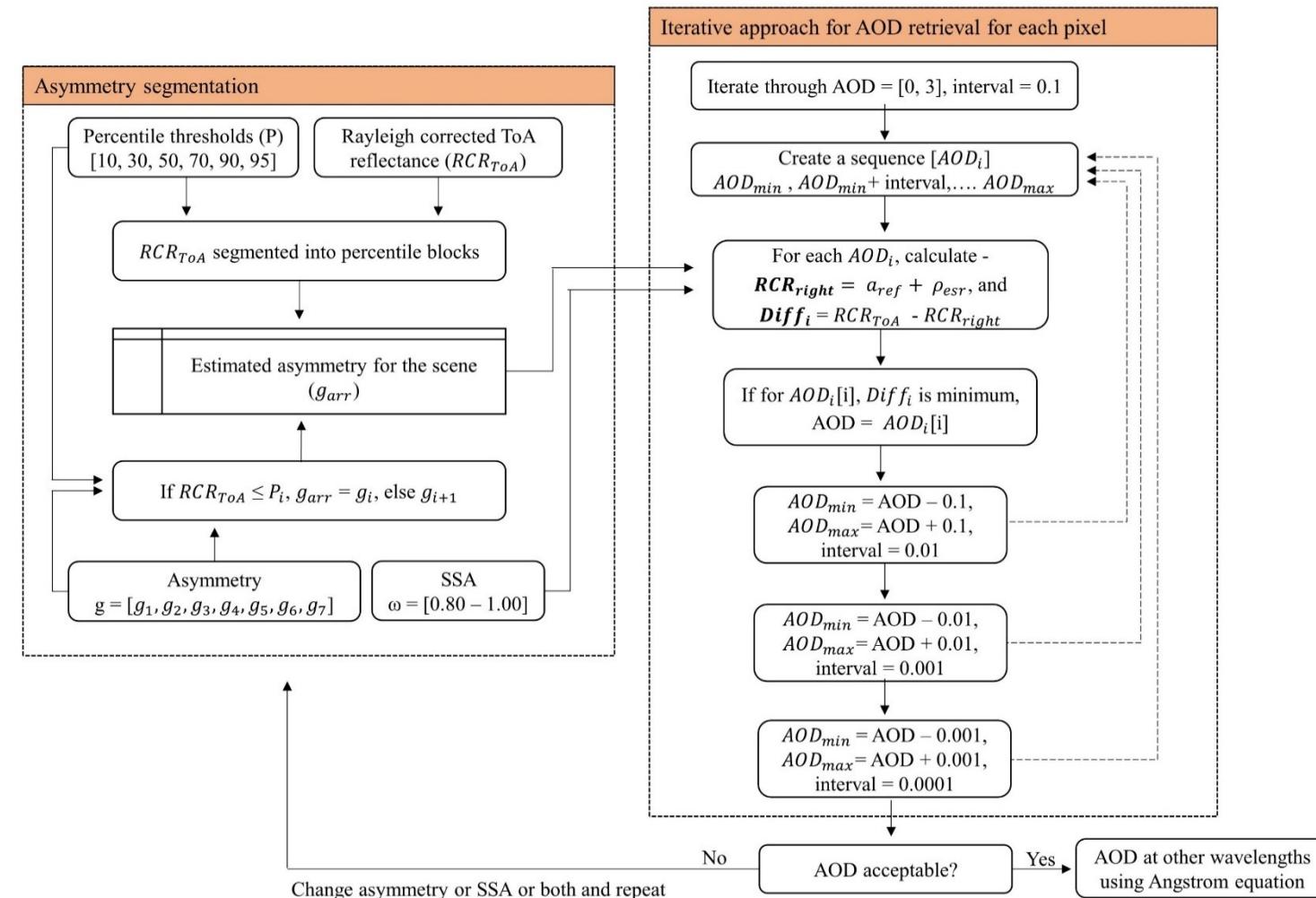
User intervention

iAOD Methodology^b (cont.)

Percentile segmentation of Rayleigh corrected reflectance image

Asymmetry assignment to each segment

Single scattering albedo (SSA) assignment



^bKumar, A., & Mehta, M. (2023). Investigating the applicability of a simple iterative approach for aerosol optical depth (AOD) retrieval over diverse land surface types from Landsat 8 and Sentinel 2 using visible and near-infrared (VNIR) spectral bands. *Atmospheric Environment*, 314, 120082.

Thank you!

Reach me at:
akhilesh.kumar@unsw.edu.au

Have questions about iAOD software access, contact
Dr. Manu Mehta at:
manu@iirs.gov.in

Missed presentation?
Scan QR for code and
slides

