**A High-Quality Reprocessed MODIS Fraction of Absorbed Photosynthetically Active Radiation Dataset (HiQ-FPAR)(Version 1)**

**1．Data Description**

The High-Quality Fraction of Absorbed Photosynthetically Active Radiation (HiQ-FPAR) is derived from reprocessed MODIS FPAR C6.1 product by Spatio-Temporal Information Compositing Algorithm (STICA). This method integrates information from multiple dimensions, including pixel quality information, spatiotemporal correlation, and original observations, to improve the raw MODIS FPAR retrievals with poor quality. The HiQ-FPAR is available in various projections and spatial resolutions. Essential details regarding the product are outlined in Table 1.

**Table 1.** Dataset characteristics of the HiQ-FPAR Product

|  |  |
| --- | --- |
| Characteristics | HiQ-FPAR Product |
| Temporal Coverage | February 18, 2000 – December 31,2023 |
| Area | Global Vegetated Land |
| Projection | WGS1984 |
| Spatial Resolution | 500m/5km |
| Temporal Resolution | 8 days |
| Fill Value | 255 |
| Data Type | Uint8 |
| File Format | TIFF(.tif) |

The HiQ-FPAR product offers 4 Science Datasets (Fig. 1), comprising FPAR, original quality control information, relative temporal stability of HiQ-FPAR, and the absolute difference between HiQ-FPAR and MODIS FPAR. To address considerations regarding data storage size, the original values have been adjusted to integers. Users are advised to refer to the scaling factors provided in Table 2 for value restoration when utilizing the data.



Fig. 1 Scientific Datasets of the HiQ-FPAR

**Table 2.** Scientific Datasets included in the HiQ-FPAR Product

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Scientific**  **Data Sets** | **Definition** | **Bite Type** | **Fill Value** | **Valid Range** | **Scale Factor** |
| Fpar | HiQ 500M Fraction of Absorbed Photosynthetically Active Radiation | uint8 | 249-255 | 0-100 | 0.01 |
| Fpar\_QC | QC for FPAR | uint8 | 255 | 0-254 | Null |
| Re\_TSS\_HiQ | Relative Time-series Stability  for HiQ-FPAR | uint8 | 255 | 0-10 | 0.001 |
| Fpar\_Diff | Difference of Fraction of Absorbed Photosynthetically Active Radiation between MODIS FPAR and HiQ-FPAR | uint8 | Null | 0-255 | 100 |

The HiQ-FPAR is available in two projections of different spatial resolutions (Table 3). Data sets at 500m were stored in Google Earth Engine for users to mix and match with other datasets and the availability of this dataset in the GEE platform would significantly benefit the GEE community, fostering easier access and utilization of this valuable resource. A 5km projection of HiQ-FPAR was derived by upscaling the original 500m data using the nearest-neighbour method can be found in Zenodo.

**Table 3. Projections and spatial/temporal resolutions of HiQ-FPAR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Dataset | Projection | Spatial Resolution | Temporal Resolution | Repository | Interpolation Method |
| 500m\_8day | WGS1984 | 500m | 8 days | GEE | --- |
| 5km\_8day | WGS1984 | 5km | 8 days | Zenodo | Nearest-neighbour |
| 5km\_8day | WGS1984 | 5km | 8 days | GEE | Bicubic |

**2. Filenames Convention**

The HiQ-FPAR product file name follows certain naming convention, providing useful information about a specific product. For example, the filename HiQ\_FPAR\_WGS84\_5km\_8day\_2022361.tif indicates:

* HiQ：Product Short Name
* FPAR：Land Surface Type
* WGS84：Projection Information.
* 5km: Spatial Resolution
* 8day: Temporal Resolution
* 2022361：Julian Date of Acquisition（YYYYDDD）, DDD=DOY (Day of Year)
* .tif：Data Format

**3. Data Availability**

The dataset links are as follows:

1) <https://doi.org/10.5281/zenodo.10683549> (spatial resolution is 5km and temporal resolution is 8 days)

2) <https://code.earthengine.google.com/?asset=projects/verselab-398313/assets/HiQ_Fpar/wgs_500m_8d> (spatial resolution is 500m and temporal resolution is 8 days, Nearest-neighbour)

3) <https://code.earthengine.google.com/?asset=projects/verselab-398313/assets/HiQ_Fpar/wgs_5km_8d_Bicubic> (spatial resolution is 500m and temporal resolution is 8 days, Bicubic)

**4.** **Data Read Example (For Google Earth Engine)**

Here is a Google Earth Engine example for the version that spatial resolution is 500m and temporal resolution is 8 days:

var Year = 2021

var HiQ = ee.ImageCollection('projects/verselab-398313/assets/HiQ\_Fpar/wgs\_500m\_8d')

print(HiQ) // // print HiQ dataset information to console

var HiQ\_filter = HiQ.filterDate(Year+'-01-01', Year+'-12-31')

//.select('Fpar', 'Fpar\_QC')

// // If user wants to filter the year or month:

// var HiQ\_Filtet\_Y = HiQ.filter(ee.Filter.calendarRange(i, j, 'year'))

// var HiQ\_Filtet\_M = HiQ.filter(ee.Filter.calendarRange(i, j, 'month'))

var colorizedVis = {

min: 0,

max: 100, // 10, 100,

palette: [

'FFFFFF', 'CE7E45', 'DF923D', 'F1B555', 'FCD163', '99B718', '74A901',

'66A000', '529400', '3E8601', '207401', '056201', '004C00', '023B01',

'012E01', '011D01', '011301'

],

};

// // add special band to map layer

// .first(): add the first image of imageCollection

Map.addLayer(HiQ \_filter.select('Fpar').first(), colorizedVis, 'Fpar');

Map.addLayer(HiQ \_filter.select('Fpar'\_QC'), {}, 'QC');

Map.addLayer(HiQ \_filter.select(' Re\_TSS\_MOD'),{}, 'TSS\_M');

Map.addLayer(HiQ \_filter.select(' Re\_TSS\_HiQ'),{}, 'TSS\_Overall');

Map.addLayer(HiQ \_filter.select(' 'Fpar'\_Diff'),{}, 'Diff');

**5. Data Read Example (For Python)**

Here is a python example for the version that spatial resolution is 5km and temporal resolution is 8 days:

import numpy as np

from osgeo import gdal

import matplotlib.pyplot as plt

def readTif(fileName):

dataset = gdal.Open(fileName)

if dataset == None:

print(fileName+" Failed to open")

return dataset

def render\_Img (data, title='', savepath='', color=plt.cm.jet, axisType = 'off'):

plt.imshow(data, cmap = color) # cmap= plt.cm.jet

plt.title(title, family='Times New Roman', fontsize=18)

plt.rcParams['font.size'] = 13

plt.rcParams['font.family'] = 'Times New Roman'

# plt.colorbar()

plt.axis(axisType)

if issave :plt.savefig(savepath, dpi=300)

plt.show()

year = 2021

for idx in range(1, 362, 8):

## read data

file = readTif(f'HiQ\_FPAR\_WGS84\_5km\_8day\_{year}{idx:03d}.tif').ReadAsArray()

## Visually display the HiQ-Fpar and Fpar\_QC

render\_Img(file[0]/10, title= 'FPAR')

render\_Img(file[1], title=’QC’)

**6. Data Read Example (For Matlab)**

Here is a matlab example for the version that spatial resolution is 5km and temporal resolution is 8 days:

clear;clc

% set the input dir

inpath = '.\HiQ\_ FPAR \WGS84\_5km\_8d\';

year = 2021;

for doy=161 %1:8:361

% check the prefix

prefix = ' HiQ\_ FPAR \_WGS84\_5km\_8day\_ ';

inname = strcat(inpath,prefix,num2str(year\*1000+doy),'.tif');

% read data

data = imread(inname);

data = double(data);

data(data == 255) = nan;

FPAR =data(:,:,1)/100;

FPAR \_Diff=data(:,:,7)-100;

% Visually display the HiQ- FPAR, Difference of FPAR between MODIS FPAR and HiQ- FPAR

figure(1); imagesc(FPAR);

figure(2); imagesc(FPAR \_Diff);

end

**7. Contact**

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