

## Data Access

The EPIC ocean surface PAR products are available at the Atmospheric Science Data Center (ASDC) at NASA Langley Research Center: <https://asdc.larc.nasa.gov>.

To download the EPIC ocean surface PAR products, visit <https://asdc.larc.nasa.gov>, go to “Data -> Direct Data download -> DSCOVER -> EPIC -> L3\_PAR\_01”, and select the data that is of interest.

An alternative way is going to “Data -> Browse Projects”, select “DSCOVER”, you will be directed to <https://asdc.larc.nasa.gov/project/DSCOVER>. At the bottom of the page, under tab “Level 3”, click “DSCOVER\_EPIC\_L3\_PAR\_01”, and you will be directed to [https://asdc.larc.nasa.gov/project/DSCOVER/DSCOVER\\_EPIC\\_L3\\_PAR\\_01](https://asdc.larc.nasa.gov/project/DSCOVER/DSCOVER_EPIC_L3_PAR_01). This can also be done by Search “DSCOVER PAR” and Choose “DSCOVER\_EPIC\_L3\_PAR\_01” in the returned results. Click “Get Dataset” on the right side of the page ([https://asdc.larc.nasa.gov/project/DSCOVER/DSCOVER\\_EPIC\\_L3\\_PAR\\_01](https://asdc.larc.nasa.gov/project/DSCOVER/DSCOVER_EPIC_L3_PAR_01)). By doing this, you will be directed to a new webpage, where you can use the “Start” and “End” Date on the left side to select a period of data that you would like to download.

### Download using cURL and Wget

To download files using cURL and Wget, here is a step by step guide (you can also check <https://wiki.earthdata.nasa.gov/display/EL/How+To+Access+Data+With+cURL+And+Wget>).

1. Make sure you have a NASA earthdata login account. To register a new account, visit the website <https://urs.earthdata.nasa.gov>, select “REGISTER”, and follow the instructions.
2. Configure your username and password for authentication using a .netrc file

```
> cd ~
> touch .netrc
> echo "machine urs.earthdata.nasa.gov login uid_goes_here password
password_goes_here" > .netrc
> chmod 0600 .netrc
```

where `uid_goes_here` is your Earthdata Login username and `password_goes_here` is your Earthdata Login password. Note that some password characters can cause problems. A backslash or space anywhere in your password will need to be escaped with an additional backslash. Similarly, if you use a '#' as the first character of your password, it will also need to be escaped with a preceding backslash. Depending on your environment, the use of double-quotes " may be turned into "smart-quotes" automatically. We recommend turning this feature off. Some users have found that the double quotes are not supported by their systems. Some users have found that the > is aliased to >> on some machines. This will append the text instead of overwriting the text. We recommend checking your ~/.netrc file to ensure it only has one line.

If your uid is `some_user` and your password is `ABCdef123!` this line should look like:

```
> echo "machine urs.earthdata.nasa.gov login some_user password
ABCdef123!" > .netrc
```

3. Create a cookie file. This will be used to persist sessions across individual cURL/Wget calls, making it more efficient.

```
> cd ~
> touch .urs_cookies
```

4. Download your data.

4.1. If downloading one file at a time,

Using cURL:

```
> curl -O -b ~/.urs_cookies -c ~/.urs_cookies -L -n http://server/path
```

or Wget:

```
> wget --load-cookies ~/.urs_cookies --save-cookies ~/.urs_cookies --
keep-session-cookies http://server/path
```

where `http://server/path` is the url of the data.

The url of the EPIC PAR data is composed in such convention (take data of Jan 15, 2018 as an example):

```
https://asdc.larc.nasa.gov/data/DSCOVER/EPIC/L3_PAR_01/2018/01/DSCOVER_EPIC_L3_PAR
_01_20180115_18km.h5
```

where 2018 is the year, 01 is the month, and 20180115 is the exact date.

4.2. If downloading multiple files at a time, you can generate a list of urls using the example Python script shown below (the urls will be saved in a text file named “download\_list.txt”):

```
import numpy as np
from datetime import date, timedelta

def generate_url(year, month, day):
    return
    'https://asdc.larc.nasa.gov/data/DSCOVER/EPIC/L3_PAR_01/'+str(year)+'/'+('%
02d' % month)+'/DSCOVER_EPIC_L3_PAR_01_'+str(year)+'('%02d' %
month)+'('%02d' % day)+'_18km.h5'

# download data from 2018-1-1 to 2018-1-30
# you can modify the dates here
d1=date(2018,1,1)
d2=date(2018,1,31)
```



```

delta=d2-d1 # get the number of days between the two dates

fid=open('download_list.txt','w')
for i in range(delta.days+1):
    d=d1+timedelta(days=i)
    url=generate_url(d.year,d.month,d.day)
    fid.write(url+'\n')
fid.close()

```

Using cURL:

```

#!/bin/sh
fetch_urls() {
    while read -r line; do
        curl -b ~/.urs_cookies -c ~/.urs_cookies -L -n -f -Og $line &&
    echo || exit_with_error "Command failed with error. Please retrieve the
data manually."
    done;
}
fetch_urls <<'EDSCEOF'
# Insert URLs here
EDSCEOF

```

or Wget:

```

wget --load-cookies ~/.urs_cookies --save-cookies ~/.urs_cookies --auth-
no-challenge=on --no-check-certificate --content-disposition -i
download_list.txt

```

## Data Extraction

The EPIC ocean surface PAR products are in HDF5 format. Both Level 3 binned (a global nearly equal-area integerized sinusoidal grid of 1024 rows, <https://oceancolor.gsfc.nasa.gov/docs/format/l3bins/>) and Level 3 mapped (an equal-angle Plate Carrée grid) data are stored in the same file. To generate Level 3 binned daily average PAR, Level 2 daily PAR is computed for each EPIC observation during the day, binned into a global nearly equal-area integerized sinusoidal grid (1024 rows), and then averaged using the cosine of solar zenith angle corresponding to each observation as weights. For both data, the corresponding latitude, longitude, and flags are available. Especially for Level 3 binned PAR, the

north and south latitude and the west and east longitude of each bin are also provided. The figure below shows the detailed organization of the data.

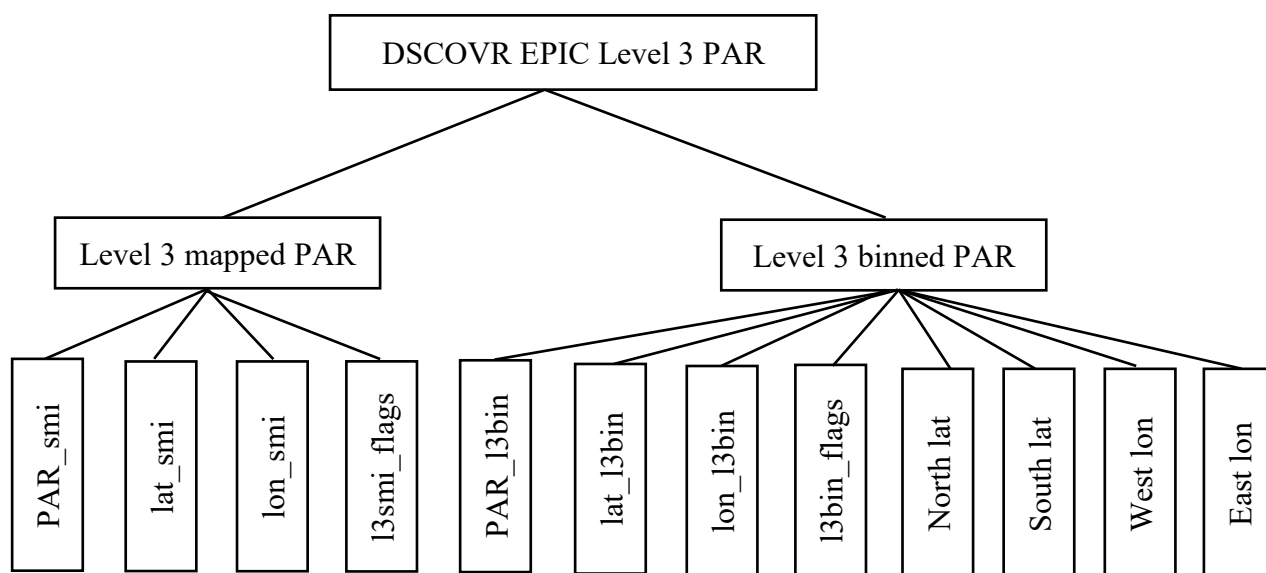


Figure 1. Detailed organization of the DSCOVR EPIC Level 3 PAR data.

Here is an example Python script of extracting Level 3 binned and Level 3 mapped PAR. The package “h5py” is needed (<https://docs.h5py.org/en/stable/quick.html>).

To extract Level 3 mapped PAR,

```
import h5py

fname='DSCOVR_EPIC_L3_PAR_01_20200908_18km.h5'

f=h5py.File(fname, 'r')
```

```

print(f.keys()) # ['Level-3_bin', 'Level-3_smi']

print(f['Level-3_smi'].keys())

PAR_l3smi=f['Level-3_smi']['PAR_l3smi'][()] # Level 3 mapped PAR
flags=f['Level-3_smi']['l3smi_flags'][()] # 1 - glint, 2 - land, 4 -
seaice
lat=f['Level-3_smi']['lat_l3smi'][()] # latitude
lon=f['Level-3_smi']['lon_l3smi'][()] # longitude

f.close()

```

To extract Level 3 binned PAR,

```

import h5py

fname='DSCOVREPIC_L3_PAR_01_20200908_18km.h5'

f=h5py.File(fname,'r')

print(f.keys()) # ['Level-3_bin', 'Level-3_smi']

print(f['Level-3_bin'].keys())

PAR_l3bin=f['Level-3_bin']['PAR_l3bin'][()] # Level 3 binned PAR
flags=f['Level-3_bin']['l3bin_flags'][()] # 1 - glint, 2 - land, 4 -
seaice
lat=f['Level-3_bin']['lat_l3bin'][()] # latitude
lon=f['Level-3_bin']['lon_l3bin'][()] # longitude
north=f['Level-3_bin']['North lat'][()] # north latitude of each bin
south=f['Level-3_bin']['South lat'][()] # south latitude of each bin
west=f['Level-3_bin']['West lon'][()] # West longitude of each bin
east=f['Level-3_bin']['East lon'][()] # East longitude of each bin

f.close()

```

