UMD/SRB-Modis Model For inst SW at 5km

Using MODIS product version 6.1

1. Package for Preparing input parameters.

*Part I Needed products for this package*

1. MISR Level 3 Aerosol product covering a month (MIL3MAE or MIL3MAN)
2. MODIS level3 weekly snow and ice product (MOD10C2 & MYD10C2)
3. MODIS level3 daily snow and ice product (MOD10C1 & MYD10C1)
4. Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I-SSMIS Passive Microwave Data, Version 1, including both daily and monthly data and covering both North and South hemisphere.
5. Precipitable water of NCEP-DOE daily reanalysis 2.
6. MODIS Aerosol (MOD04/MYD04), Cloud (MOD06/MYD06) and Atmosphere profiles (MOD07/MYD07) Level 2 products
7. Other auxiliary data—UMD prepared including land sea mask, surface type, surface elevation, Cloud layer thickness model coefficients, averaged albedo map.

 *Part II Short Descriptions of code to prepare inputs (saved in folder “user”)*

1. “prep\_input.m”— Main function define time stamp, I/O path, and run subroutines to prepare inputs for calculating fluxes.

 Variables need to be changed:

“prepOut**Path”:** location to put prepared input for fluxes calculation==location of output of prep\_input.m

“yrV ; monV; dayV”: define the datetime of data to be processed

2. “prep\_aerosol.m”—Subroutine to extract aerosol parameters, including define Input path of MODIS and MIDSR aerosol products and Output path of aerosol parameters.

 Variables need to be changed in function “prepare\_aerosol\_5km”

in**Path**ModisAer: Location to put MODIS aerosol product (MOD04/MYD04)

in**Path**MisrAer: Location to put MISR aerosol product

3. “prep\_cloud.m”—Subroutine to extract cloud parameters, including define Input path of MODIS cloud products and Output path of cloud parameters.

 Variables need to be changed in function “prepare\_cloud\_5km”

 in**Path**ModisCld: Location to put MODIS cloud product (MOD06/MYD06)

4. “prep\_albedo.m”—Subroutine to prepare albedo parameters, including to define Input path of MODIS snow and ice products and Sea Ice Concentrations, and Output path of albedo parameters.

in**Path**16DayAlb\_5km & in**Path**SfcTyp\_5km: Location to put albedo & surface type data (UMD prepared and can be found in AUXDATA)

in**Path**DailySnow: location to put MODIS daily snow product (MOD10C1/MYD10C1)

in**Path**8DaySnow: location to put MODIS 8-day snow product (MOD10C2/MYD10C2)

in**Path**SeaIce: location to put sea ice data

5. “prep\_profile.m”—Subroutine to extract other parameters (including ozone, water vapor, solar zenith angle), including to define Input path of MODIS products and NCEP-DOE reanalysis2 and Output path of other parameters.

Variables need to be changed in function “prepare\_profile\_5km”

in**Path**Prof: Location to put MODIS atmosphere profiles product (MOD07/MYD07)

in**Path**NCEPPwtr: Location to put NCEP pwater reanalysis

in**Path**Elev: Location to put elevation data (UMD prepared and can be found in AUXDATA)

6. “obtain\_ncepPwtr.m”—Subroutine to read precipitable water parameters from NCEP-DOE reanalysis2. Must pay attention to this subroutine and may need to modify when the NCEP-DOE reanalysis2 data name or format has been updated. This subroutine is used by “prep\_profile.m”

7. “obtain\_hdf\_datafield.m” —Subroutine to read desired data from HDF files.

8. “ssmiMapLL.m” —subroutine to convert from geodetic latitude and longitude to Polar Stereographic (X, Y) coordinates for the polar regions.

1. Package of Calculating Fluxes.

*Part I Short descriptions of Codes*

1. “modis\_run.py” — Main function to define time stamp, I/O path and run executable file. (saved in folder “user”)

Variables need to be changed

input**Path:** location forprepared input path for fluxes calculation

resultPath: location to put fluxes

years; months; day: define the datetime of fluxes to be calculated

2. “modis\_make” — Make file to generate the executable file. (saved in folder “user”)

3. “modis\_config.nml” — namelist. (Currently no need to change anything, (saved in folder “user”)

4. “modis\_main\_v33.1.f90” — Main program to call subroutines (saved in folder “rtm”)

5. “Srb\_MODIS\_userAer.f” — Compute the instantaneous shortwave up- and down fluxes at specified pressure levels at a single location from given column-amount of ozone and water vapor, aerosol and cloud optical properties, spectral surface albedo, and solar zenith angle. (saved in folder “rtm”)

*Part II fluxes Outputs (saved in “results”)*

The final outputs include both fluxes for all sky and clear sky.

All-sky fluxes are as following

Flxall(Ip,Iv) , Ip=1…5, Iv=1…3

Ip=1, top of atmosphere down-flux

Ip=2, top of atmosphere up-flux

Ip=3, surface down-flux

Ip=4, surface up-flux

Ip=5, diffuse surface down-flux

Iv=1, shortwave (0.2-4.0 microns)

Iv=2, visible (PAR)

Iv=3, near infrared

Flxclr(Ip,Iv) is as Flxall but for clear-sky fluxes

Please note that all fluxes (both allsky and clearsky) are in W m-2.

1. Software requirement

1. Matlab

2. Python2

3. pgf95

1. Folder structure

1. input data

MOD\_DATA/

├── aerosol

│   └── 2015

├── cloud

│   └── 2015

├── MOD10C1

├── MOD10C2

├── MYD10C1

├── MYD10C2

└── profile

 └── 2015

seaice/

├── north

│   ├── daily

│   └── monthly

└── south

 ├── daily

 └── monthly

MISR

pwater/

├── 6hourly

└── daily

2. prepared input folder-- named as “input”

input/

├── aerosol

│   ├── 2015

│   │   ├── aqua

│   │   └── terra

│   └── src

├── albedo

│   ├── 2015

│   │   ├── aqua

│   │   └── terra

│   └── src

├── cloud

│   ├── 2015

│   │   ├── aqua

│   │   └── terra

│   └── src

├── input

│   ├── 2015

│   │   ├── aqua

│   │   └── terra

│   └── src

└── profile

 ├── 2015

 │   ├── aqua

 │   └── terra

 └── src

3. output fluxes saved in “results”

results/

├── 2015

│   ├── aqua

│   └── terra

├── log

└── src

1. To show images

In folder “user”

The script “Plot\_qklook\_MODIS\_SRB\_5km\_input.m” is to quick look prepared inputs

The script “plot\_quicklook.m” is to quick look fluxes.