

# **pyModis Documentation**

***Release 2.0.3***

**Luca Delucchi**

**Dec 19, 2016**

## CONTENTS

<b>1</b>	<b>About pyModis</b>	<b>2</b>
1.1	Requirements . . . . .	2
1.2	How to install pyModis . . . . .	2
1.3	Troubleshooting . . . . .	4
1.4	How to report a bug . . . . .	5
1.5	How to compile documentation . . . . .	5
1.6	Ohloh statistics . . . . .	6
<b>2</b>	<b>pyModis Scripts</b>	<b>7</b>
2.1	modis_download.py . . . . .	8
2.2	modis_download_from_list.py . . . . .	10
2.3	modis_parse.py . . . . .	12
2.4	modis_multiparse.py . . . . .	14
2.5	modis_mosaic.py . . . . .	15
2.6	modis_convert.py . . . . .	17
2.7	modis_quality.py . . . . .	20
<b>3</b>	<b>Examples</b>	<b>22</b>
3.1	Scripts . . . . .	22
3.2	Library . . . . .	25
<b>4</b>	<b>pyModis Library</b>	<b>27</b>
4.1	downmodis module . . . . .	28
4.2	parsemodis module . . . . .	32
4.3	convertmodis module . . . . .	39
4.4	convertmodis_gdal module . . . . .	41
4.5	qualitymodis module . . . . .	44
4.6	optparse_required module . . . . .	45
4.7	optparse_gui module . . . . .	46
	<b>Python Module Index</b>	<b>48</b>
	<b>Index</b>	<b>49</b>

`pyModis` is a Free and Open Source Python based library to work with MODIS data. It offers bulk-download for user selected time ranges, mosaicking of MODIS tiles, and the reprojection from Sinusoidal to other projections, convert HDF format to other formats and the extraction of data quality information.

`pyModis` library was developed to replace old bash scripts developed by Markus Neteler to download MODIS data from NASA FTP server. It is very useful for [GIS and Remote Sensing Platform of Fondazione Edmund Mach](#) to update its large collection of MODIS data.

It has several features:

- for downloading large numbers of MODIS HDF/XML files and for using it in a cron job for continuous automated updating; it supports both FTP and HTTP NASA repositories
- parses the XML file to obtain information about the HDF files
- converts a HDF MODIS file to GEOTIFF format by either using [MODIS Reprojection Tool](#) or [GDAL](#) (`pyModis`  $\geq$  1.0)
- creates a mosaic of several tiles by either using [MODIS Reprojection Tool](#) or [GDAL](#) (`pyModis`  $\geq$  1.0)
- creates the XML metadata file with the information of all tiles used for the mosaic
- extracts specific information from bit-encoded MODIS quality assessment layers of different product types
- Graphical User Interface for each script written in [wxPython](#) (`pyModis`  $\geq$  1.0)
- it support Python 2 and Python 3 (`pyModis`  $\geq$  2.0)

We acknowledge the [Fondazione Edmund Mach](#) for promoting the development of free and open source software.

## ABOUT PYMODIS

### 1.1 Requirements

pyModis requires **Python GDAL** and **Numpy** packages.

If you want to use the Graphical User Interface you have to install also **wxPython** library.

You can use also software is **MODIS Reprojection Tool** to convert or mosaic MODIS HDF files.

#### 1.1.1 User and password

To be able to download data you need user and password provided by NASA. Please **register** at <https://urs.earthdata.nasa.gov/users/new>; now login and move to your profile page. Go to “My application” tab and approve the following applications “LP DAAC Data Pool” and “Earthdata Search”.

If you are an already registered user, login and enable the applications at <https://urs.earthdata.nasa.gov/home>

### 1.2 How to install pyModis

#### 1.2.1 Using pip

From version 0.6.3 it is possible to install pyModis using **pip**. You have to run the following command as administrator

```
pip install pyModis
```

If you need to update your pyModis version you have to run

```
pip install --upgrade pyModis
```

With pip it is also really simple to remove the library

```
pip uninstall pyModis
```

#### 1.2.2 Compile from source

Compile pyModis is very simple. First you need to download pyModis source code from [github repository](#).

You can use [git](#) to download the latest code (with the whole history and so it contain all the different stable versions, from the last to the first)

```
git clone https://github.com/lucadelu/pyModis.git
```

or [download the latest stable version](#) from the repository and decompress it.

Now enter the pyModis folder and launch as administrator of your computer

```
python setup.py install
```

If the installation doesn't return any errors you should be able to use pyModis library from a Python console. Then, launch a your favorite Python console (I really suggest `ipython`) and digit

```
import pymodis
```

If the console doesn't return any error like this

```
ImportError: No module named pymodis
```

the pyModis library has been installed properly and you can use it or one of the tools distributed with pyModis.

If you want to install into `/usr/local/`, run

```
python setup.py install --prefix=/usr/local
```

In this case, if you get the following error

```
TEST FAILED: /usr/local/lib/python2.7/site-packages/ does NOT support .pth_
↳files
```

then you need to define the PYTHONPATH environmental variable

```
export PYTHONPATH=/usr/local/lib/python2.7/site-packages
python setup.py install --prefix=/usr/local
```

and now re-run the installation command.

### 1.2.3 Install on Windows with osgeo4w

**Warning:** Using this way to install pyModis it will be possible to use pyModis only from OSGeo4W environment.

It will not possible to use other versions of Python except the OSGeo4W one.

The simple way to install pyModis on Windows is to use [OSGeo4W](#).

---

**Note:** To execute OSGeo4W may be required to run it as Administrator.

---

Choose *Advanced Install* in the first step of installation and set the corrected value until the packages selection.

At this point select the following packages:

- *gdal-python*
- *python-numpy*
- *python-requests*
- *python-future*
- *wxpython*

OSGeo4W will install all the required dependencies.

At this point, using the OSGeo4W shell, you can follow [Compile from source](#) section to install pyModis.

### 1.2.4 Install on Windows without osgeo4w (old and not updated)

Another way to install pyModis on Windows is to install latest Python 2.7 from <http://python.org/download/>

Now you have to modify the “Path” environment variable using *powershell* running

```
[Environment]::SetEnvironmentVariable("Path",  
"$env:Path;C:\Python27\;C:\Python27\Scripts\","User")
```

Download and install the last version of Distribute for Windows from [http://python-distribute.org/distribute\\_setup.py](http://python-distribute.org/distribute_setup.py)

At this point you have to move to standard command line (*cmd*) and install *pip* using *easy\_install*

```
easy_install pip
```

Now install *numpy* library using *easy\_install* because installation from *pip* is broken (this is required only for version  $\geq 0.7.1$ )

```
easy_install numpy GDAL
```

If you want the Graphical User Interface you have to install also **wxPython**

```
easy_install WxPython WxPython-Common
```

Finally install pyModis using *pip*

```
pip install pyModis
```

If you want use the GUI you have to [download and install wxPython](#)

## 1.3 Troubleshooting

### 1.3.1 Problem installing dependencies with pip

**Warning:** Sometimes *pip* return error when it try to install Python GDAL, Numpy or wxPython. You can solve this problem installing Python GDAL or Numpy using the version of your operating system.

## 1.4 How to report a bug

If you find any problems in `pyModis` library you can report it using the [issues tracker of github](#).

## 1.5 How to compile documentation

This documentation has been made with [Sphinx](#), so you need to install it to compile the original files to obtain different output formats.

Please enter the `docs` folder of `pyModis` source and run

```
make <target>
```

with one of the following target to obtain the desired output:

- **html**: to make standalone HTML files
- **dirhtml**: to make HTML files named `index.html` in directories
- **singlehtml**: to make a single large HTML file
- **pickle**: to make pickle files
- **json**: to make JSON files
- **htmlhelp**: to make HTML files and a HTML help project
- **qthelp**: to make HTML files and a qthelp project
- **devhelp**: to make HTML files and a Devhelp project
- **epub**: to make an epub
- **latex**: to make LaTeX files, you can set `PAPER=a4` or `PAPER=letter`
- **latexpdf**: to make LaTeX files and run them through `pdflatex`
- **text**: to make text files
- **man**: to make manual pages
- **texinfo**: to make Texinfo files
- **info**: to make Texinfo files and run them through `makeinfo`
- **gettext**: to make PO message catalogs
- **changes**: to make an overview of all changed/added/deprecated items
- **linkcheck**: to check all external links for integrity
- **doctest**: to run all doctests embedded in the documentation (if enabled)

### 1.5.1 PDF link in HTML

To insert a link to PDF file of pyModis documentation into HTML documentation (the link will be added on the sidebar) you have to compile first the PDF and after the HTML, so you need to launch:

```
make latexpdf
make html
```

If PDF file is missing no link will be added

## 1.6 Ohloh statistics

For more information about pyModis please visit the [pyModis Ohloh page](#)



## PYMODIS SCRIPTS

The `pyModis` **scripts** provide you with a complete toolkit to work with MODIS data, you can download, analyze and convert the data. They are developed to work from command line and inside scripts to automatically update your MODIS files dataset. From version 1.0 the scripts have also Graphical User Interface.

Currently the tools are:

- *modis\_download.py*
- *modis\_download\_from\_list.py*
- *modis\_parse.py*
- *modis\_multiparse.py*
- *modis\_mosaic.py*
- *modis\_convert.py*
- *modis\_quality.py*

## 2.1 modis\_download.py

**modis\_download.py** downloads MODIS data from NASA FTP servers. It can download large amounts of data and it can be profitably used with cron jobs to receive data with a fixed delay of time.

**Warning:** Remember to register yourself at <https://urs.earthdata.nasa.gov/users/new>, read more at *User and password* session.

### 2.1.1 Usage

```
modis_download.py [options] destination_folder
```

### 2.1.2 Options

```
-h --help          shows the help message and exit
-u --url           http/ftp server url [default=http://e4ftl01.cr.usgs.gov]
-I --input         insert user and password from standard input
-P --password      password to connect
-U --username      username to connect
-t --tiles         string of tiles separated by comma
                   [default=none] for all tiles
-s --source        directory on the http/ftp server
                   [default=MOLT]
-p --product       product name as on the http/ftp server
                   [default=MOD11A1.005]
```

```

-D --delta      delta of day starting from first day [default=10]
-f --firstday   the day to start download, if you want change
                 data you have to use this format YYYY-MM-DD
                 ([default=none] is for today)
-e --endday     the day to finish download, if you want change
                 data you have to use this format YYYY-MM-DD
                 ([default=none] use delta option)
-x             useful for debugging the download
                 [default=False]
-j             download also the jpeg files [default=False]
-O             download only one day, it sets delta=1 [default=False]
-A             download all days, useful for initial download of a
                 product. It overwrites the 'firstday' and 'endday'
                 options [default=False]
-r             remove files with size same to zero from
                 'destination_folder' [default=False]

```

### 2.1.3 Examples

Download Terra LST data for a month for two tiles from HTTP server

```

modis_download.py -I -r -t h18v03,h18v04 -f 2008-01-01 -e 2008-01-31 lst_
→terra/

```

Download the last 15 days of Aqua LST data

```

modis_download.py -I -r -s MOLA -p MYD11A1.005 -t h18v03,h18v04 -D 15 lst_
→aqua/

```

Download all tiles of NDVI for one day (you have pick the right day otherwise it does not download anything)

```

modis_download.py -U user -P passwd -r -p MOD13Q1.005 -f 2010-12-31 -O

```

Download Snow product from FTP server

```

modis_download.py -I -u ftp://n4ftl01u.ecs.nasa.gov -p mail@pymodis.com
-s SAN/MOST -p MOD10A1.005

```

## 2.2 modis\_download\_from\_list.py

**modis\_download\_from\_list.py** downloads MODIS data from NASA servers, the names of files to download have to be contained into a text file.

**Warning:** Remember to register yourself at <https://urs.earthdata.nasa.gov/users/new>, read more at *User and password* session.

### 2.2.1 Usage

```
modis_download_from_list.py [options] destination_folder
```

### 2.2.2 Options

```
-h --help          show the help message and exit
-f --file          Input file containing data to donwload
-u --url           http/ftp server url [default=http://e4ftl01.cr.usgs.gov]
-I --input         insert user and password from standard input
-P --password      password to connect
-U --username      username to connect
-t --tiles         string of tiles separated from comma
                   [default=none] for all tiles
-s --source        directory on the http/ftp
                   [default=MOLT]
-p --product       product name as on the http/ftp server
                   [default=MOD11A1.005]
-x                this is useful for debugging the download
                   [default=False]
-j                download also the jpeg files [default=False]
```

### 2.2.3 Examples

The following text should be in your *MODTiles.txt* file

```
MOD11A1.A2012278.h19v11.005.*.hdf*
MOD11A1.A2012278.h19v12.005.*.hdf*
MOD11A1.A2012278.h20v11.005.*.hdf*
MOD11A1.A2012278.h20v12.005.*.hdf*
MOD11A1.A2012278.h21v11.005.*.hdf*
```

Download Terra LST data from the above text file

```
modis_download_from_list.py -U user -P passwd -f /tmp/MODTiles.txt /tmp
```

The following text should be in your *MYDTiles.txt* file

```
MYD11A1.A2012278.h19v11.005.*.hdf*
MYD11A1.A2012278.h19v12.005.*.hdf*
MYD11A1.A2012278.h20v11.005.*.hdf*
MYD11A1.A2012278.h20v12.005.*.hdf*
MYD11A1.A2012278.h21v11.005.*.hdf*
```

Download Aqua LST data from the above text file

```
modis_download_from_list.py -I -s MOLA -p MYD11A1.005 -f /tmp/MYDTiles.txt ↵
↵ /tmp
```

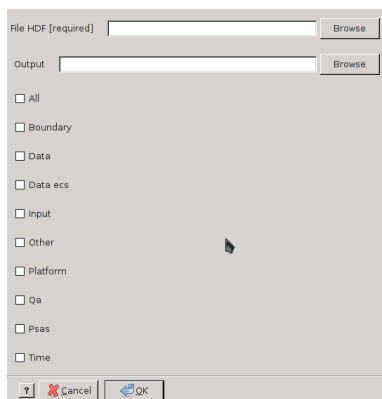
## 2.3 modis\_parse.py

**modis\_parse.py** parses the XML metadata file for a MODIS tile and return the requested value. It can also write the metadata information into a text file.

### 2.3.1 Usage

```
modis_parse.py [options] hdf_file
```

### 2.3.2 Options



```
-h --help      show the help
-w --write     write the chosen information into a file
-a            print all possible values of metadata
-b            print the values related to the spatial max extent
-d            print the values related to the date files
-e            print the values related to the ECSDataGranule
-i            print the input layers
-o            print the other values
-p            print the values related to platform
-q            print the values related to quality
-s            print the values related to psas
-t            print the values related to times
-l            print the names of layer in HDF file
```

### 2.3.3 Examples

Return all values of metadata

```
modis_parse.py -a hdf_file
```

Write all values to a file

```
modis_parse.py -a -w metadata_FILE.txt hdf_file
```

Print spatial extent and quality

```
modis_parse.py -b -q hdf_file
```

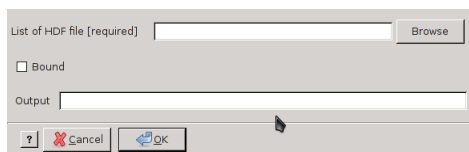
## 2.4 modis\_multiparse.py

**modis\_multiparse.py** parses several XML metadata files for MODIS tiles. It is very useful to create XML metadata file for a mosaic.

### 2.4.1 Usage

```
modis_multiparse.py [options] hdf_files_list
```

### 2.4.2 Options



```
-h --help      show the help
-b            print the values related to the spatial max extent
-w --write     write the MODIS XML metadata file for MODIS mosaic
```

### 2.4.3 Examples

Print values of spatial bounding box

```
modis_multiparse.py -b hdf_file1 hdf_file2 ...
```

Write xml file to use with hdf file created by *modis\_convert.py*

```
modis_multiparse.py -w FILE_mosaic.xml hdf_file1 hdf_file2 ...
```



## 2.5 modis\_mosaic.py

**modis\_mosaic.py** creates a mosaic of several MODIS tiles in HDF format, using MRT mrtmosaic software or GDAL library.

### 2.5.1 Usage

```
modis_mosaic.py [options] hdflist_file
```

### 2.5.2 Options

```
General options:
  -o OUTPUT_FILE, --output=OUTPUT_FILE
                        (Required) the name or prefix (for VRT) of output
                        mosaic
  -s SUBSET, --subset=SUBSET
                        a subset of product layers. The string should be
                        similar to: 1 0 [default: all layers]

Options for GDAL:
  -f OUTPUT_FORMAT, --output-format=OUTPUT_FORMAT
                        output format supported: GTiff, HDF4Image
                        [default=GTiff]
  -v, --vrt
                        Create a GDAL VRT file. No other GDAL options have to
                        been set

Options for MRT:
  -m MRT_PATH, --mrt=MRT_PATH
                        (Required) the path to MRT software
```

### 2.5.3 Examples

## Using the MODIS Reprojection Tool

Convert all the layers of several tiles

```
modis_mosaic.py -m "/usr/local/bin/" -o FILE_mosaic MOSAIC_FILES_LIST
```

Convert LAYERS of several LST MODIS tiles

```
modis_mosaic.py -s "1 0 1 0" -m "/usr/local/bin/" -o FILE_mosaic MOSAIC_  
→FILES_LIST
```

## Using GDAL

Convert the first LAYERS of several tiles with resolution 1km in GeoTIFF format

```
modis_mosaic.py -o FILE_mosaic.tif -s "1" MOSAIC_FILES_LIST
```

Create a mosaic with all the layers of several tiles in HDF4Image format

```
modis_mosaic.py -o FILE_mosaic.hdf -f HDF4Image MOSAIC_FILES_LIS
```

Create VRT file for all subset. It creates a VRT file for each subset with the chosen prefix (-o flag) and the name of layer as suffix

```
modis_mosaic.py -o mosaic_vrt -v MOSAIC_FILES_LIS
```

## 2.6 modis\_convert.py

**modis\_convert.py** converts MODIS data to TIF formats and different projection reference system. It is an interface to MRT mrtmosaic software or GDAL library.

### 2.6.1 Usage

```
modis_convert.py [options] hdf_file
```

### 2.6.2 Options

```
-h, --help          show this help message and exit
```

Required options:

```
-s SUBSET, --subset=SUBSET
                        (Required) a subset of product's layers. The string
                        should be similar to: ( 1 0 )
-o OUTPUT_FILE, --output=OUTPUT_FILE
```

```

        (Required) the prefix of output file
-g RESOLUTION, --grain=RESOLUTION
        the spatial resolution of output file
-r RESAMPLING_TYPE, --resampl=RESAMPLING_TYPE
        the method of resampling. -- mrt methods:
        'NEAREST_NEIGHBOR', 'BICUBIC', 'CUBIC_CONVOLUTION',
        'NONE' -- gdal methods: 'AVERAGE', 'BILINEAR',
        'CUBIC', 'CUBIC_SPLINE', 'LANCZOS', 'MODE',
        'NEAREST_NEIGHBOR' [default=NEAREST_NEIGHBOR]

Options for GDAL:
-f OUTPUT_FORMAT, --output-format=OUTPUT_FORMAT
        output format supported by GDAL [default=GTiff]
-e EPSG, --epsg=EPSG
        EPSG code for the output
-w WKT, --wkt_file=WKT
        file or string containing projection definition in
→WKT
        format
-v, --vrt
        Read from a GDAL VRT file.
--formats
        print supported GDAL formats

Options for MRT:
-m MRT_PATH, --mrt=MRT_PATH
        the path to MRT software
-d DATUM, --datum=DATUM
        the code of datum. Available: 'NODATUM', 'NAD27',
        'NAD83', 'WGS66', 'WGS72', 'WGS84' [default=WGS84]
-t PROJECTION_SYSTEM, --proj_type=PROJECTION_SYSTEM
        the output projection system. Available: 'AEA', 'GEO
→',
        'HAM', 'IGH', 'ISIN', 'LA', 'LCC', 'MOL', 'PS', 'SIN
→',
        'TM', 'UTM', 'MERCAT' [default=GEO]
-p PROJECTION_PARAMETERS, --proj_parameters=PROJECTION_PARAMETERS
        a list of projection parameters, for more info check
        the 'Appendix C' of MODIS reprojection tool user's
        manual https://lpdaac.usgs.gov/content/download/4831/
→2
        2895/file/mrt41_usermanual_032811.pdf [default=( 0.0
        0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
        0.0 )]
-u UTM_ZONE, --utm=UTM_ZONE
        the UTM zone if projection system is UTM
        the UTM zone if projection system is UTM

```

### 2.6.3 Examples

**Warning:** The resolution value in `modis_convert.py` has to be set with the right value depending on the projection used. 1 kilometer in metrical projection has to be set as 1000 meter, instead in latitude and longitude something like  $0.01^\circ$  depending on the placement in the Earth.

## MODIS Reprojection Tools

**Warning:** You can find the supported projections in the ‘Appendix C’ of [MODIS reprojection tool user’s manual](#) and the datums at section [Datum Conversion](#) of the same manual

Convert layers from MODIS data with the original resolution in latitude and longitude reference system

```
modis_convert.py -s "( 1 0 1 0 )" -o OUTPUT_FILE -m "/usr/local/bin/" FILE
```

Convert layers from MODIS data with output resolution in 500 meters with UTM projection in the 32 zone

```
modis_convert.py -s "( 1 0 1 0 )" -o OUTPUT_FILE -m "/usr/local/bin/" -g ↵
↵500 -p UTM -u 32 FILE
```

## GDAL

Convert the first layer in latitude and longitude with the original resolution

```
modis_convert.py -s "( 1 )" -o OUTPUT_FILE -e 4326 FILE
```

Convert the first three layers from MODIS data with output resolution in 500 meters with UTM projection in the 32 zone

```
modis_convert.py -s "( 1 1 1 )" -o OUTPUT_FILE -g 500 -e 32632 FILE
```

## 2.7 modis\_quality.py

**modis\_quality.py** checks the quality of MODIS data using the QA layer

### 2.7.1 Usage

```
modis_quality.py [options] input_file destination_file
```

### 2.7.2 Options

```
-h, --help            show this help message and exit
-o OUTPUT_FILE, --output=OUTPUT_FILE
                        (Required) the prefix of output file
-t TYPE, --type=TYPE  quality type either as number or name (e.g. 1 or
                        VIQuality for MOD13 products) [default=1]
-l LAYER, --qualitylayer=LAYER
                        quality layer of the dataset, dependent on the used
                        MODIS product. (e.g. 1 or QC_Day for the Daytime QC
                        Layer of MOD11) [default=1]
-p PRODUCT, --producttype=PRODUCT
                        quality layer of the dataset, dependent on the used
                        MODIS product. (e.g. 1 or QC_Day for the Daytime QC
                        Layer of MOD11) [default=MOD13Q1]
```

### 2.7.3 Examples

Extract VI Usefulness value from MOD13 product

```
modis_quality.py -t 2 infile.hdf -o outfile.tif
```

Extract shadow mask from MOD13 product

```
modis_quality.py -t 9 input_file.hdf -o destination_file.tif
```

Extract Emissivity error flag of Nighttime LSTE quality control from MOD11C1 product

```
modis_quality.py -t 4 -l 2 infile.hdf -o outfile.tif
```

Extract MODLAND QA value from MOD13Q1 mosaic

```
modis_quality.py -t 1 -p MOD13Q1 input_file.hdf -o destination_file.tif
```

## EXAMPLES

Some example about `pyModis` library and script

### 3.1 Scripts

- *Example of a full process with GDAL library*
- *Example reproject data with MRT*



### 3.1.1 Example of a full process with GDAL library

In this short example you will learn how to run a series of scripts to obtain a GeoTIFF file for each band of the chosen product using as backend GDAL library.

**Warning:** This example is based on a Linux based system. If you use another operating system you need to change the paths where data will be saved

#### Downloading data

For first you need to obtain data, so you need to use *modis\_download.py*

```
mkdir $HOME/tmp
modis_download.py -I -f 2012-12-05 -O -t h28v05,h29v05,h28v04 $HOME/tmp
```

**Warning:** In this example we are working on the spatial extent of Italy: for your area of interest, change the tile name(s) according to your region.

User and password are passed through standard input.

We are going to download data for only one day (2012-12-05) using the option “-O”.

Inside the `$HOME/tmp/` directory you will find a file called *listfileMOD11A1.005.txt* containing the names of downloaded files. The name of file is related to the product that you want to download.

**Warning:** Every time that you download new files of the same product they will be overwritten, so if you need them, you must rename the file before.

#### Mosaic data

At this point you need to create the mosaic of the tiles downloaded. *modis\_mosaic.py* is the script to use. We create a *VRT* file (flag `-v`) to improve the speed of analysis, without losing any data only for the first layer

```
modis_mosaic.py -s "1" -o $HOME/tmp/mosaic -v $HOME/tmp/listfileMOD11A1.
↪005.txt
```

The command will create a file called `mosaic_LST_Day_1km.vrt` in `$HOME/tmp/` directory

#### Convert data

The last part of the procedure is to convert the mosaic using *modis\_convert.py*. Using *VRT* format it create dataset of only one later, so you are forced to use `-s "( 1 )"`. The following command create a GeoTIFF file called `final_mosaic_LST_Day_1km.vrt.tif`

```
modis_convert.py -v -s "( 1 )" -o $HOME/tmp/final -e 4326 $HOME/tmp/mosaic_
↪LST_Day_1km.vrt
```

### 3.1.2 Example reproject data with MRT

In this short example you can understand how to concatenate the scripts to obtain a GeoTIFF file for each band of the chosen product using as backend MODIS Reprojection Tools (MRT).

**Warning:** This example is based on a Linux based system. Please if you use other OS change the paths where data will be saved

#### Downloading data

For first you need to obtain data, so you need to use `modis_download.py`

```
modis_download.py -I -f 2012-12-05 -O -t h28v05,h29v05,h28v04 /tmp
```

**Warning:** In this example we are working on Japan extension, so please change the name of tiles according with your region.

User and password are passed through standard input.

In this example we download data for only one day (2012-12-05) using the option “-O”.

Inside `/tmp/` directory you will find a file called `listfileMOD11A1.005.txt` containing the names of files downloaded. The name of file it is related to the product that you download.

**Warning:** Every time that you download new files of same product it will be overwrite, so if you need it, you should rename the file

#### Mosaic data

`modis_mosaic.py` is the script to use.

```
modis_mosaic.py -m /path/to/mrt/ -o /tmp/outputfile /tmp/listfileMOD11A1.  
↪005.txt
```

**Warning:** `/path/to/mrt/` is the directory where Modis Reprojection Tools is stored

The output of this command are `outputfile.hdf` and `outputfile.hdf.xml` inside the directory `/tmp`. It's reading the input files contained in `listfileMOD11A1.005.txt`

#### Convert data

The last part of the procedure is to convert the mosaic, from HDF format and sinusoidal projection, to GeoTIFF with several projection. You have to use `modis_convert.py`

```
modis_convert.py -s '( 1 1 1 1 1 1 1 1 1 1 1 1 )' -m /path/to/mrt/
                  -o /tmp/finalfile.tif -g 250 /tmp/outputfile.hdf
```

## Extract quality information

If necessary, you can extract specific quality type from the chosen quality layer. In this particular case, we extract the Mandatory QA flag of the daytime temperature. You have to use *modis\_quality.py*

```
modis_quality.py -p MOD11A1 -l 1 -t 1 /tmp/outputfile.hdf
/tmp/mod11a1_daytime_qaflag.tif
```

## 3.2 Library

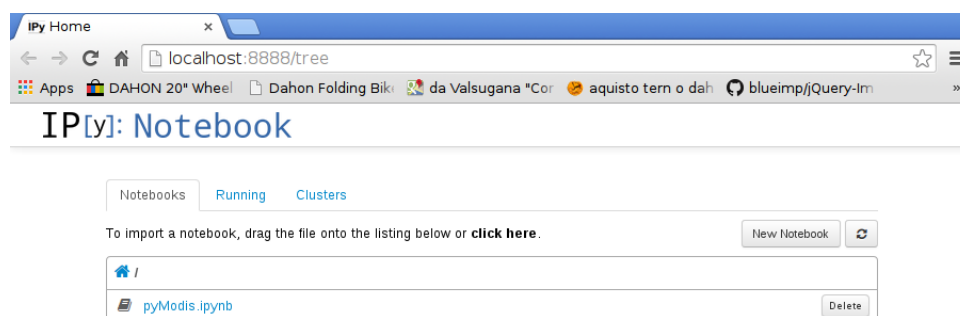
To test pyModis library you can find an *Ipython notebook* example in the documentation source code. If you already downloaded pyModis source code you have just to move inside the directory `pyModis/docs/source/examples` otherwise you can download the needed file from [source code](#) and move to the directory where you downloaded the file.

At this point you can start *Ipython notebook* running a notebook server from the command line using the following command

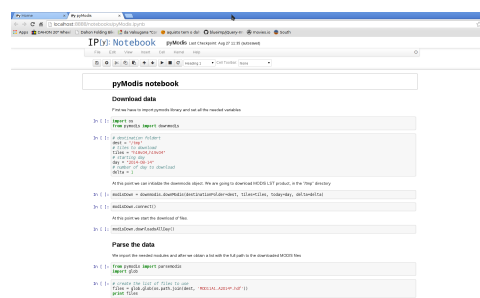
```
ipython notebook
```

This will print some information about the notebook server in your console, and open a web browser to the URL of the web application.

The landing page of the IPython notebook web application, the dashboard, shows the notebooks currently available in the notebook directory (in our case only **pyModis.ipynb**).



Clicking on **pyModis.ipynb** link you will start the notebook



**Warning:** You have to install `pyModis` before run the [Ipython notebook](#) example.

## PYMODIS LIBRARY

`pyModis` library it is a Python library to work with MODIS data.

It can easily used in your application to download, analyze, convert and check the quality of MODIS data.

`pyModis` can be used in other free and open source software, it is already present in GRASS GIS used by `r.in.modis` addon.

It is compose by this modules:

- *downmodis module*
- *parsemodis module*
- *convertmodis module*
- *convertmodis\_gdal module*
- *qualitymodis module*
- *optparse\_required module*

## 4.1 downmodis module

Module to download MODIS HDF files from NASA repository. It supports both FTP and HTTP repositories

Classes:

- `modisHtmlParser`
- `downModis`

Functions:

- `urljoin()`
- `getNewerVersion()`
- `str2date()`

**class** `pymodis.downmodis.ModisHTTPRedirectHandler`

Bases: `future.backports.urllib.request.HTTPRedirectHandler`

**http\_error\_302** (*req, fp, code, msg, headers*)

**class** `pymodis.downmodis.downModis` (*destinationFolder*, *password=None*, *user='anonymous'*, *url='http://e4ftl01.cr.usgs.gov'*, *tiles=None*, *path='MOLT'*, *product='MOD11A1.005'*, *today=None*, *enddate=None*, *delta=10*, *jpg=False*, *debug=False*, *timeout=30*, *checkgdal=True*)

A class to download MODIS data from NASA FTP or HTTP repositories

### Parameters

- **destinationFolder** (*str*) – where the files will be stored
- **password** (*str*) – the password, it should be your email address to connect to a FTP server. Do not use this variable if the server is an HTTP server
- **user** (*str*) – the user name, by default 'anonymous', used to connect to an FTP server. Do not use this variable if the server is an HTTP server
- **url** (*str*) – the base url from where to download the MODIS data, it can be FTP or HTTP but it has to start with 'ftp://' or 'http://'
- **path** (*str*) – the directory where the data that you want to download are stored on the FTP server. For HTTP requests, this is the part of the url between the 'url' parameter and the 'product' parameter.
- **product** (*str*) – the code of the product to download, the code should be identical to the one of the url
- **tiles** (*str*) – a set of tiles to be downloaded, None == all tiles. This can be passed as a string of tileIDs separated by commas, or as a list of individual tileIDs
- **today** (*str*) – the day to start downloading; in order to pass a date different from today use the format YYYY-MM-DD

- **enddate** (*str*) – the day to end downloading; in order to pass a date use the format YYYY-MM-DD. This day must be before the ‘today’ parameter. Downloading happens in reverse order (currently)
- **delta** (*int*) – timelag i.e. the number of days starting from today backwards. Will be overwritten if ‘enddate’ is specified during instantiation
- **jpeg** (*bool*) – set to True if you want to download the JPG overview file in addition to the HDF
- **debug** (*bool*) – set to True if you want to obtain debug information
- **timeout** (*int*) – Timeout value for HTTP server (seconds)
- **checkgdal** (*bool*) – variable to set the GDAL check

**checkDataExist** (*listNewFile*, *move=False*)

Check if a file already exists in the local download directory

**Parameters**

- **listNewFile** (*list*) – list of all files, returned by getFilesList function
- **move** (*bool*) – it is useful to know if a function is called from download or move function

**Returns** list of files to download

**checkFile** (*filHdf*)

Check by using GDAL to be sure that the download went ok

**Parameters** **filHdf** (*str*) – name of the HDF file to check

**Returns** 0 if file is correct, 1 for error

**closeFTP** ()

Close ftp connection and close the file list document

**closeFilelist** ()

Function to close the file list of where the files are downloaded

**connect** (*ncon=20*)

Connect to the server and fill the dirData variable

**Parameters** **ncon** (*int*) – maximum number of attempts to connect to the HTTP server before failing

**dayDownload** (*day*, *listFilesDown*)

Downloads tiles for the selected day

**Parameters**

- **day** (*str*) – the day in format YYYY.MM.DD
- **listFilesDown** (*list*) – list of the files to download, returned by checkDataExist function

**debugDays** ()

This function is useful to debug the number of days

**debugLog** ()

Function to create the debug file

**Returns** a Logger object to use to write debug info

**debugMaps** ()

Prints the files to download to the debug stream

**downloadFile** (*filDown*, *filHdf*, *day*)

Download a single file

**Parameters**

- **filDown** (*str*) – name of the file to download
- **filHdf** (*str*) – name of the file to write to
- **day** (*str*) – the day in format YYYY.MM.DD

**downloadsAllDay** (*clean=False*, *allDays=False*)

Download all requested days

**Parameters**

- **clean** (*bool*) – if True remove the empty files, they could have some problems in the previous download
- **allDays** (*bool*) – download all passable days

**getAllDays** ()

Return a list of all days

**getFilesList** (*day=None*)

Returns a list of files to download. HDF and XML files are downloaded by default. JPG files will be downloaded if `self.jpeg == True`.

**Parameters** **day** (*str*) – the date of data in format YYYY.MM.DD

**Returns** a list of files to download for the day

**getListDays** ()

Return a list of all selected days

**removeEmptyFiles** ()

Function to remove files in the download directory that have filesize equal to 0

**setDirectoryIn** (*day*)

Enter into the file directory of a specified day

**Parameters** **day** (*str*) – a string representing a day in format YYYY.MM.DD

**setDirectoryOver** ()

Move up within the file directory

`pymodis.downmodis.getNewerVersion` (*oldFile*, *newFile*)

Check two files to determine which is newer

**Parameters**

- **oldFile** (*str*) – one of the two similar files
- **newFile** (*str*) – one of the two similar files

**Returns** the name of newer file



**class** `pymodis.downmodis.modisHtmlParser(fh)`

Bases: `HTMLParser.HTMLParser`

A class to parse HTML

**Parameters** `fh` – content of http request

**get\_all()**

Return everything

**get\_dates()**

Return a list of directories with date

**get\_tiles**(*prod, tiles, jpeg=False*)

Return a list of files to download

**Parameters**

- **prod**(*str*) – the code of MODIS product that we are going to analyze
- **tiles**(*list*) – the list of tiles to consider
- **jpeg**(*bool*) – True to also check for jpeg data

**handle\_starttag**(*tag, attrs*)

`pymodis.downmodis.str2date(datestring)`

Convert to `datetime.date` object from a string

:param `str datestring` string with format (YYYY-MM-DD) :return: a `datetime.date` object representing `datestring`

`pymodis.downmodis.urljoin(*args)`

Joins given arguments into a url. Trailing but not leading slashes are stripped for each argument.

<http://stackoverflow.com/a/11326230>

**Returns** a string

## 4.2 parsemodis module

Simple class to parse MODIS metadata file, it can also write the XML metadata file for a mosaic.

Classes:

- `parseModis`
- `parseModisMulti`

**class** `pymodis.parsemodis.parseModis` (*filename*)

Class to parse MODIS xml files, it can also create the parameter configuration file for resampling MODIS DATA with the MRT software or convertmodis Module

**Parameters** `filename` (*str*) – the name of MODIS hdf file

**confResample** (*spectral*, *res=None*, *output=None*, *datum='WGS84'*, *resample='NEAREST\_NEIGHBOR'*, *projtype='GEO'*, *utm=None*, *projpar='( 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 )'*, *bound=None*)

Create the parameter file to use with resample MRT software to create tif (geotiff) file

### Parameters

- **spectral** (*str*) – the spectral subset to be used, see the product table to understand the layer that you want use. For example:
  - NDVI ( 1 1 1 0 0 0 0 0 0 0 0 ) copy only layer NDVI, EVI and QA VI the other layers are not used
  - LST ( 1 1 0 0 1 1 0 0 0 0 0 ) copy only layer daily and nightly temperature and QA
- **res** (*int*) – the resolution for the output file, it must be set in the map unit of output projection system. The software will use the original resolution of input file if res not set
- **output** (*str*) – the output name, if not set if not set the prefix name of input hdf file will be used
- **utm** – the UTM zone if projection system is UTM
- **resample** (*str*) – the type of resampling, the valid values are:
  - NN (nearest neighbor)
  - BI (bilinear)
  - CC (cubic convolution)
- **projtype** (*str*) – the output projection system, valid values are:
  - AEA (Albers Equal Area)
  - ER (Equirectangular)
  - GEO (Geographic Latitude/Longitude)
  - HAM (Hammer)
  - ISIN (Integerized Sinusoidal)
  - IGH (Interrupted Goode Homolosine)

- LA (Lambert Azimuthal)
- LCC (LambertConformal Conic)
- MERCAT (Mercator)
- MOL (Mollweide)
- PS (Polar Stereographic)
- SIN (Sinusoidal)
- UTM (Universal TransverseMercator)
- **datum** (*str*) – the datum to use, the valid values are:
  - NAD27
  - NAD83
  - WGS66
  - WGS76
  - WGS84
  - NODATUM
- **projpar** (*str*) – a list of projection parameters, for more info check the Appendix C of MODIS reprojection tool user manual [https://lpdaac.usgs.gov/content/download/4831/22895/file/mrt41\\_usermanual\\_032811.pdf](https://lpdaac.usgs.gov/content/download/4831/22895/file/mrt41_usermanual_032811.pdf)
- **bound** (*dict*) – dictionary with the following keys:
  - max\_lat
  - max\_lon
  - min\_lat
  - min\_lon

```
confResample_swath(sds, geoloc, res, output=None, sphere='8', resample='NN',  
                    projtype='GEO', utm=None, projpar='0.0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0', bound=None)
```

**Create the parameter file to use with resample MRT software to** create tif (geotiff) file

#### Parameters

- **sds** (*str*) – Name of band/s (Science Data Set) to resample
- **geoloc** (*str*) – Name geolocation file (example MOD3, MYD3)
- **res** (*int*) – the resolution for the output file, it must be set in the map unit of output projection system. The software will use the original resolution of input file if res not set
- **output** (*str*) – the output name, if not set the prefix name of input hdf file will be used
- **sphere** (*int*) – Output sphere number. Valid options are:
  - 0=Clarke 1866

- 1=Clarke 1880
- 2=Bessel
- 3=International 1967
- 4=International 1909
- 5=WGS 72
- 6=Everest
- 7=WGS 66
- 8=GRS1980/WGS 84
- 9=Airy
- 10=Modified Everest
- 11=Modified Airy
- 12=Walbeck
- 13=Southeast Asia
- 14=Australian National
- 15=Krassovsky
- 16=Hough
- 17=Mercury1960
- 18=Modified Mercury1968
- 19=Sphere 19 (Radius 6370997)
- 20=MODIS Sphere (Radius 6371007.181)
- **resample** (*str*) – the type of resampling, the valid values are:
  - NN (nearest neighbor)
  - BI (bilinear)
  - CC (cubic convolution)
- **projtype** (*str*) – the output projection system, valid values are:
  - AEA (Albers Equal Area)
  - ER (Equirectangular)
  - GEO (Geographic Latitude/Longitude)
  - HAM (Hammer)
  - ISIN (Integerized Sinusoidal)
  - IGH (Interrupted Goode Homolosine)
  - LA (Lambert Azimuthal)
  - LCC (LambertConformal Conic)
  - MERCAT (Mercator)

- MOL (Mollweide)
- PS (Polar Stereographic),
- SIN ()Sinusoidal)
- UTM (Universal TransverseMercator)
- **utm** – the UTM zone if projection system is UTM
- **projpar** (*str*) – a list of projection parameters, for more info check the Appendix C of MODIS reprojection tool user manual [https://lpdaac.usgs.gov/content/download/4831/22895/file/mrt41\\_usermanual\\_032811.pdf](https://lpdaac.usgs.gov/content/download/4831/22895/file/mrt41_usermanual_032811.pdf)
- **bound** (*dict*) – dictionary with the following keys:
  - max\_lat
  - max\_lon
  - min\_lat
  - min\_lon

**getGranule()**

Set the GranuleURMetaData element

**getLayersName** (*output=None*)

Return the names of layers using GDAL

**Parameters** **output** (*str*) – the path of the file where write the output

**getMeasureName** (*output=None*)

Return the names of measure names

**Parameters** **output** (*str*) – the path of the file where write the output

**getRoot()**

Set the root element

**retBoundary()**

Return the maximum extend (Bounding Box) of the MODIS file as dictionary

**retBrowseProduct()**

Return the BrowseProduct element

**retCollectionMetaData()**

Return the CollectionMetaData element as dictionary

**retDTD()**

Return the DTDVersion element

**retDataCenter()**

Return the DataCenterId element

**retDataFiles()**

Return the DataFiles element as dictionary

**retDataGranule()**

Return the ECSDDataGranule elements as dictionary

**retDbID()**

Return the DbID element

**retGranuleUR()**

Return the GranuleUR element

**retInputGranule()**

Return the input files (InputGranule) used to process the considered file

**retInsertTime()**

Return the InsertTime element

**retLastUpdate()**

Return the LastUpdate element

**retMeasure()**

Return statistics of QA as dictionary

**retPGEVersion()**

Return the PGEVersion element

**retPSA()**

Return the PSA values as dictionary, the PSAName is the key and PSAValue is the value

**retPlatform()**

Return the platform values as dictionary.

**retRangeTime()**

Return the RangeDateTime elements as dictionary

**class** `pymodis.parsemodis.parseModisMulti(hdflist)`

A class to obtain some variables for the xml file of several MODIS tiles. It can also create the xml file

**Parameters** `hdflist` (*list*) – python list containing the hdf files

**valBound()**

Function return the Bounding Box of mosaic

**valBrowseProduct(obj)**

Function to add BrowseGranuleId

**Parameters** `obj` – element to add BrowseGranuleId

**valCollectionMetaData(obj)**

Function to add CollectionMetaData

**Parameters** `obj` – element to add CollectionMetaData

**valDTD(obj)**

Function to add DTDVersion

**Parameters** `obj` – element to add DTDVersion

**valDataCenter(obj)**

Function to add DataCenter

**Parameters** `obj` – element to add DataCenter

**valDataFiles(obj)**

Function to add DataFileContainer

**Parameters** `obj` – element to add DataFileContainer

**valDataGranule** (*obj*)

Function to add DataFileContainer

**Parameters** *obj* – element to add DataFileContainer

**valDbID** (*obj*)

Function to add DbID

**Parameters** *obj* – element to add DbID

**valGranuleUR** (*obj*)

Function to add GranuleUR

**Parameters** *obj* – element to add GranuleUR

**valInputPointer** (*obj*)

Function to add InputPointer

**Parameters** *obj* – element to add InputPointer

**valInsTime** (*obj*)

Function to add the minimum of InsertTime

**Parameters** *obj* – element to add InsertTime

**valInsertTime** (*obj*)

Function to add InsertTime elements

**Parameters** *obj* – element to add InsertTime elements

**valLastUpdate** (*obj*)

Function to add LastUpdate elements

**Parameters** *obj* – element to add LastUpdate elements

**valMeasuredParameter** (*obj*)

Function to add ParameterName

**Parameters** *obj* – element to add ParameterName

**valPGEVersion** (*obj*)

Function to add PGEVersion

**Parameters** *obj* – element to add PGEVersion

**valPSA** (*obj*)

Function to add PSA

**Parameters** *obj* – element to add PSA

**valPlatform** (*obj*)

Function to add Platform elements

**Parameters** *obj* – element to add Platform elements

**valRangeTime** (*obj*)

Function to add RangeDateTime

**Parameters** *obj* – element to add RangeDateTime

**writexml** (*outputname*, *pretty=True*)

Write a xml file for a mosaic

**Parameters**

- **outputname** (*str*) – the name of output xml file
- **pretty** (*bool*) – write prettyfy output, by default true



## 4.3 convertmodis module

Convert MODIS HDF file to GeoTiff file or create a HDF mosaic file for several tiles using Modis Reprojection Tools.

Classes:

- `convertModis`
- `createMosaic`
- `processModis`

Functions:

- `checkMRTpath()`

`pymodis.convertmodis.checkMRTpath(mrtpath)`

Function to check if MRT path it correct

**Parameters** `mrtpath` (*str*) – the path to MRT directory

**Returns** The path to ‘bin’ and ‘data’ directory inside MRT path

**class** `pymodis.convertmodis.convertModis(hdfname, confile, mrtpath)`

A class to convert modis data from hdf to tif using resample (from MRT tools)

**Parameters**

- **hdfname** (*str*) – the full path to the hdf file
- **confile** (*str*) – the full path to the paramater file
- **mrtpath** (*str*) – the full path to mrt directory which contains the bin and data directories

**executable()**

Return the executable of resample MRT software

**run()**

Exec the conversion process

**class** `pymodis.convertmodis.createMosaic(listfile, outprefix, mrtpath, subset=False)`

A class to convert several MODIS tiles into a mosaic

**Parameters**

- **listfile** (*str*) – the path to file with the list of HDF MODIS file
- **outprefix** (*str*) – the prefix for output files
- **mrtpath** (*str*) – the full path to mrt directory which contains the bin and data directories
- **subset** (*str*) – a string composed by 1 and 0 according with the layer to mosaic. The string should something like ‘1 0 1 0 0 0 0’

**executable()**

Return the executable of mrtmosaic MRT software

**run()**

Exect the mosaic process

**write\_mosaic\_xml()**

Write the XML metadata file for MODIS mosaic

**class** `pymodis.convertmodis.processModis` (*hdfname, confile, mrtpath*)

A class to process raw modis data from hdf to tif using swath2grid (from MRT Swath tools)

**Parameters**

- **hdfname** (*str*) – the full path to the hdf file
- **confile** (*str*) – the full path to the paramater file
- **mrtpath** (*str*) – the full path to mrt directory which contains the bin and data directories

**executable()**

Return the executable of resample MRT software

**run()**

Exec the conversion process

## 4.4 convertmodis\_gdal module

Convert MODIS HDF file using GDAL Python bindings. It can create GeoTiff file (or other GDAL supported formats) or HDF mosaic file for several tiles.

Classes:

- `file_info`
- `createMosaicGDAL`
- `convertModisGDAL`

Functions:

- `getResampling()`
- `raster_copy()`
- `raster_copy_with_nodata()`

```
class pymodis.convertmodis_gdal.convertModisGDAL (hdfname,          prefix,
                                                    subset,    res,    outfor-
                                                    mat='GTiff', epsg=None,
                                                    wkt=None,        re-
                                                    sampl='NEAREST_NEIGHBOR',
                                                    vrt=False)
```

A class to convert modis data from hdf to GDAL formats using GDAL

### Parameters

- **hdfname** (*str*) – name of input data
- **prefix** (*str*) – prefix for output data
- **subset** (*str*) – the subset to consider
- **res** (*int*) – output resolution
- **outformat** (*str*) – output format, it is possible to use all the supported GDAL format
- **epsg** (*int*) – the EPSG code for the preprojection of output file
- **wkt** (*str*) – the WKT string for the preprojection of output file
- **resampl** (*str*) – the resampling method to use
- **vrt** (*bool*) – True to read GDAL VRT file created with createMosaicGDAL

**run()**

Reproject all the subset of chosen layer

**run\_vrt\_separated()**

Reproject VRT created by createMosaicGDAL, function write\_vrt with separated=True

```
class pymodis.convertmodis_gdal.createMosaicGDAL (hdfnames, subset, outfor-
                                                    mat='HDF4Image')
```

A class to mosaic modis data from hdf to GDAL formats using GDAL

### Parameters

- **hdfnames** (*list*) – a list containing the name of tile to mosaic

- **subset** (*str*) – the subset of layer to consider
- **outformat** (*str*) – the output format to use, this parameter is not used for the VRT output, supported values are HDF4Image, GTiff, HFA, and maybe something else not tested.

**run** (*output*)

Create the mosaic

**Parameters** **output** (*str*) – the name of output file

**write\_mosaic\_xml** (*prefix*)

Write the XML metadata file for MODIS mosaic

**Parameters** **prefix** (*str*) – the prefix for the XML file containing metadata

**write\_vrt** (*output*, *separate=True*)

Write VRT file

**Parameters**

- **output** (*str*) – the prefix of output file
- **separate** (*bool*) – True to write a VRT file for each band, False to write an unique file

**class** `pymodis.convertmodis_gdal.file_info`

A class holding information about a GDAL file.

Class copied from `gdal_merge.py`

**Parameters** **filename** (*str*) – Name of file to read.

**Returns** 1 on success or 0 if the file can't be opened.

**copy\_into** (*t\_fh*, *s\_band=1*, *t\_band=1*, *nodata\_arg=None*)

Copy this files image into target file.

This method will compute the overlap area of the `file_info` objects file, and the target `gdal.Dataset` object, and copy the image data for the common window area. It is assumed that the files are in a compatible projection. no checking or warping is done. However, if the destination file is a different resolution, or different image pixel type, the appropriate resampling and conversions will be done (using normal GDAL promotion/demotion rules).

**Parameters**

- **t\_fh** – `gdal.Dataset` object for the file into which some or all of this file may be copied.
- **s\_band** –
- **t\_band** –
- **nodata\_arg** –

**Returns** 1 on success (or if nothing needs to be copied), and zero on failure.

**init\_from\_name** (*filename*)

Initialize `file_info` from filename

`pymodis.convertmodis_gdal.getResampling` (*res*)

Return the GDAL resampling method

**Parameters** **res** (*str*) – the string of resampling method

```
pymodis.convertmodis_gdal.raster_copy(s_fh, s_xoff, s_yoff, s_xsize, s_ysize,  
                                         s_band_n, t_fh, t_xoff, t_yoff, t_xsize,  
                                         t_ysize, t_band_n, nodata=None)
```

Copy a band of raster into the output file.

Function copied from gdal\_merge.py

```
pymodis.convertmodis_gdal.raster_copy_with_nodata(s_fh, s_xoff, s_yoff,  
                                                    s_xsize,      s_ysize,  
                                                    s_band_n,      t_fh,  
                                                    t_xoff, t_yoff, t_xsize,  
                                                    t_ysize,      t_band_n,  
                                                    nodata)
```

Copy a band of raster into the output file with nodata values.

Function copied from gdal\_merge.py

## 4.5 qualitymodis module

A class for the extraction and transformation of MODIS quality layers to specific information

Classes:

- *QualityModis*

**class** pymodis.qualitymodis.**QualityModis** (*infile*, *outfile*, *qType=None*,  
*qLayer=None*, *pType=None*)

A Class for the extraction and transformation of MODIS quality layers to specific information

### Parameters

- **infile** (*str*) – the full path to the hdf file
- **outfile** (*str*) – the full path to the parameter file

**exportData** ()

writes calculated QA values to physical .tif file

**loadData** ()

loads the input file to the object

**loadQAArray** ()

loads the QA layer to the object

**qualityConvert** (*modisQaValue*)

converts encoded Bit-Field values to designated QA information

**run** ()

Function defines the entire process

**setProductGroup** ()

read productGroup from Metadata of hdf file

**setProductType** ()

read productType from Metadata of hdf file

**setQAGroup** ()

set QA dataset group type

**setQALayer** ()

function sets the input path of the designated QA layer

## 4.6 optparse\_required module

Module to extend optparse, it add required options and new types to use into gui module.

Classes:

- *OptionWithDefault*
- *OptionParser*

**class** pymodis.optparse\_required.**OptionParser** (*\*\*kwargs*)

Bases: `optparse.OptionParser`

Extend optparse.OptionParser

**check\_values** (*values, args*)

Check if value is required for an option

**class** pymodis.optparse\_required.**OptionWithDefault** (*\*opts, \*\*attrs*)

Bases: `optparse.Option`

Extend optparse.Option add required to the attributes and some new types for the GUI

**ATTRS** = ['action', 'type', 'dest', 'default', 'nargs', 'const', 'choices', 'callback', 'callback\_args', 'callback\_

**TYPES** = ('string', 'int', 'long', 'float', 'complex', 'choice', 'file', 'output', 'directory')

## 4.7 optparse\_gui module

A drop-in replacement for optparse (“import optparse\_gui as optparse”) Provides an identical interface to optparse(.OptionParser), But displays an automatically generated wx dialog in order to enter the options/args, instead of parsing command line arguments

Classes:

- *OptparseDialog*
- *UserCancelledError*
- *Option*
- *OptionParser*

Functions:

- *checkLabel()*

**class** pymodis.optparse\_gui.**Option** (\*opts, \*\*attrs)

Bases: *optparse.Option*

Extended optparse.Option class

**ACTIONS** = ('store', 'store\_const', 'store\_true', 'store\_false', 'append', 'append\_const', 'count', 'callback',

**ATTRS** = ['action', 'type', 'dest', 'default', 'nargs', 'const', 'choices', 'callback', 'callback\_args', 'callback\_

**SUPER**

alias of *Option*

**TYPED\_ACTIONS** = ('store', 'append', 'callback', 'group\_name')

**TYPES** = ('string', 'int', 'long', 'float', 'complex', 'choice', 'file', 'output', 'directory', 'group\_name')

**class** pymodis.optparse\_gui.**OptionParser** (\*args, \*\*kwargs)

Bases: *optparse.OptionParser*

Extended optparse.OptionParser to create the GUI for the module

**SUPER**

alias of *OptionParser*

**error** (msg)

Return an error message with wx.MessageDialog

**Parameters** **msg** (*str*) – is the error string to pass to message dialog

**parse\_args** (args=None, values=None)

This is the heart of it all overrides optparse.OptionParser.parse\_args

**Parameters**

- **arg** – is irrelevant and thus ignored, it's here only for interface compatibility
- **values** – is irrelevant and thus ignored, it's here only for interface compatibility

**class** pymodis.optparse\_gui.**OptparseDialog** (optParser, title, parent=None, ID=0,  
pos=wx.Point(-1, -1), size=wx.Size(-1, -1), style=536877120)

Bases: wx.\_windows.Dialog



The dialog presented to the user with dynamically generated controls, to fill in the required options.

#### Parameters

- **optParser** – the optparse object
- **title** (*str*) – the title to add in the GUI
- **parent** – the parent GUI
- **ID** (*int*) – the ID of GUI
- **pos** – the position of GUI
- **size** – the dimension of GUI
- **style** – the style of GUI

Based on the wx.Dialog sample from wx Docs & Demos

#### **getOptionsAndArgs** ()

Parse the options and args

**Returns** a dictionary of option names and values, a sequence of args

#### **onBrowse** (*event*)

Choose file

#### **onText** (*event*)

File changed

#### **exception** pymodis.optparse\_gui.**UserCancelledError**

Bases: `exceptions.Exception`

??

#### `pymodis.optparse_gui.checkLabel` (*option*)

Create the label for an option, it add the required string if needed

**Parameters** **option** – and Option object

**p**

`pymodis.convertmodis`, [39](#)  
`pymodis.convertmodis_gdal`, [41](#)  
`pymodis.downmodis`, [28](#)  
`pymodis.optparse_gui`, [46](#)  
`pymodis.optparse_required`, [45](#)  
`pymodis.parsemodis`, [32](#)  
`pymodis.qualitymodis`, [44](#)

## A

ACTIONS (pymodis.optparse\_gui.Option attribute), 46  
 ATTRS (pymodis.optparse\_gui.Option attribute), 46  
 ATTRS (pymodis.optparse\_required.OptionWithDefault attribute), 45

## C

check\_values() (pymodis.optparse\_required.OptionParser method), 45  
 checkDataExist() (pymodis.downmodis.downModis method), 29  
 checkFile() (pymodis.downmodis.downModis method), 29  
 checkLabel() (in module pymodis.optparse\_gui), 47  
 checkMRTpath() (in module pymodis.convertmodis), 39  
 closeFilelist() (pymodis.downmodis.downModis method), 29  
 closeFTP() (pymodis.downmodis.downModis method), 29  
 confResample() (pymodis.parsemodis.parseModis method), 32  
 confResample\_swath() (pymodis.parsemodis.parseModis method), 33  
 connect() (pymodis.downmodis.downModis method), 29  
 convertModis (class in pymodis.convertmodis), 39  
 convertModisGDAL (class in pymodis.convertmodis\_gdal), 41  
 copy\_into() (pymodis.convertmodis\_gdal.file\_info method), 42  
 createMosaic (class in pymodis.convertmodis), 39  
 createMosaicGDAL (class in pymodis.convertmodis\_gdal), 41

## D

dayDownload() (pymodis.downmodis.downModis method), 29  
 debugDays() (pymodis.downmodis.downModis method), 29  
 debugLog() (pymodis.downmodis.downModis method), 29  
 debugMaps() (pymodis.downmodis.downModis method), 30  
 downloadFile() (pymodis.downmodis.downModis method), 30  
 downloadsAllDay() (pymodis.downmodis.downModis method), 30  
 downModis (class in pymodis.downmodis), 28

## E

error() (pymodis.optparse\_gui.OptionParser method), 46  
 executable() (pymodis.convertmodis.convertModis method), 39  
 executable() (pymodis.convertmodis.createMosaic method), 39  
 executable() (pymodis.convertmodis.processModis method), 40  
 exportData() (pymodis.qualitymodis.QualityModis method), 44

## F

file\_info (class in pymodis.convertmodis\_gdal), 42

## G

get\_all() (pymodis.downmodis.modisHtmlParser method), 31  
 get\_dates() (pymodis.downmodis.modisHtmlParser method), 31  
 get\_tiles() (pymodis.downmodis.modisHtmlParser method), 31

[getAllDays\(\)](#) (pymodis.downmodis.downModis method), 30  
[getFilesList\(\)](#) (pymodis.downmodis.downModis method), 30  
[getGranule\(\)](#) (pymodis.parsemodis.parseModis method), 35  
[getLayersName\(\)](#) (pymodis.parsemodis.parseModis method), 35  
[getListDays\(\)](#) (pymodis.downmodis.downModis method), 30  
[getMeasureName\(\)](#) (pymodis.parsemodis.parseModis method), 35  
[getNewerVersion\(\)](#) (in module pymodis.downmodis), 30  
[getOptionsAndArgs\(\)](#) (pymodis.optparse\_gui.OptparseDialog method), 47  
[getResampling\(\)](#) (in module pymodis.convertmodis\_gdal), 42  
[getRoot\(\)](#) (pymodis.parsemodis.parseModis method), 35

## H

[handle\\_starttag\(\)](#) (pymodis.downmodis.modisHtmlParser method), 31  
[http\\_error\\_302\(\)](#) (pymodis.downmodis.ModisHTTPRedirectHandler method), 28

## I

[init\\_from\\_name\(\)](#) (pymodis.convertmodis\_gdal.file\_info method), 42

## L

[loadData\(\)](#) (pymodis.qualitymodis.QualityModis method), 44  
[loadQAArray\(\)](#) (pymodis.qualitymodis.QualityModis method), 44

## M

[modisHtmlParser](#) (class in pymodis.downmodis), 30  
[ModisHTTPRedirectHandler](#) (class in pymodis.downmodis), 28

## O

[onBrowse\(\)](#) (pymodis.optparse\_gui.OptparseDialog method), 47  
[onText\(\)](#) (pymodis.optparse\_gui.OptparseDialog method), 47  
[Option](#) (class in pymodis.optparse\_gui), 46  
[OptionParser](#) (class in pymodis.optparse\_gui), 46  
[OptionParser](#) (class in pymodis.optparse\_required), 45  
[OptionWithDefault](#) (class in pymodis.optparse\_required), 45  
[OptparseDialog](#) (class in pymodis.optparse\_gui), 46

## P

[parse\\_args\(\)](#) (pymodis.optparse\_gui.OptionParser method), 46  
[parseModis](#) (class in pymodis.parsemodis), 32  
[parseModisMulti](#) (class in pymodis.parsemodis), 36  
[processModis](#) (class in pymodis.convertmodis), 40  
[pymodis.convertmodis](#) (module), 39  
[pymodis.convertmodis\\_gdal](#) (module), 41  
[pymodis.downmodis](#) (module), 28  
[pymodis.optparse\\_gui](#) (module), 46  
[pymodis.optparse\\_required](#) (module), 45  
[pymodis.parsemodis](#) (module), 32  
[pymodis.qualitymodis](#) (module), 44

## Q

[qualityConvert\(\)](#) (pymodis.qualitymodis.QualityModis method), 44  
[QualityModis](#) (class in pymodis.qualitymodis), 44

## R

[raster\\_copy\(\)](#) (in module pymodis.convertmodis\_gdal), 43  
[raster\\_copy\\_with\\_nodata\(\)](#) (in module pymodis.convertmodis\_gdal), 43  
[removeEmptyFiles\(\)](#) (pymodis.downmodis.downModis method), 30  
[retBoundary\(\)](#) (pymodis.parsemodis.parseModis method), 35  
[retBrowseProduct\(\)](#) (pymodis.parsemodis.parseModis method), 35  
[retCollectionMetaData\(\)](#) (pymodis.parsemodis.parseModis method), 35  
[retDataCenter\(\)](#) (pymodis.parsemodis.parseModis method), 35  
[retDataFiles\(\)](#) (pymodis.parsemodis.parseModis method), 35

- retDataGranule() (py-modis.parsemodis.parseModis method), 35
- retDbID() (pymodis.parsemodis.parseModis method), 35
- retDTD() (pymodis.parsemodis.parseModis method), 35
- retGranuleUR() (pymodis.parsemodis.parseModis method), 35
- retInputGranule() (py-modis.parsemodis.parseModis method), 36
- retInsertTime() (pymodis.parsemodis.parseModis method), 36
- retLastUpdate() (pymodis.parsemodis.parseModis method), 36
- retMeasure() (pymodis.parsemodis.parseModis method), 36
- retPGEVersion() (py-modis.parsemodis.parseModis method), 36
- retPlatform() (pymodis.parsemodis.parseModis method), 36
- retPSA() (pymodis.parsemodis.parseModis method), 36
- retRangeTime() (pymodis.parsemodis.parseModis method), 36
- run() (pymodis.convertmodis.convertModis method), 39
- run() (pymodis.convertmodis.createMosaic method), 39
- run() (pymodis.convertmodis.processModis method), 40
- run() (pymodis.convertmodis\_gdal.convertModisGDAL method), 41
- run() (pymodis.convertmodis\_gdal.createMosaicGDAL method), 42
- run() (pymodis.qualitymodis.QualityModis method), 44
- run\_vrt\_separated() (py-modis.convertmodis\_gdal.convertModisGDAL method), 41
- S**
- setDirectoryIn() (py-modis.downmodis.downModis method), 30
- setDirectoryOver() (py-modis.downmodis.downModis method), 30
- setProductGroup() (py-modis.qualitymodis.QualityModis method), 44
- setProductType() (py-modis.qualitymodis.QualityModis method), 44
- setQAGroup() (py-modis.qualitymodis.QualityModis method), 44
- setQALayer() (py-modis.qualitymodis.QualityModis method), 44
- str2date() (in module pymodis.downmodis), 31
- SUPER (pymodis.optparse\_gui.Option attribute), 46
- SUPER (pymodis.optparse\_gui.OptionParser attribute), 46
- T**
- TYPED\_ACTIONS (py-modis.optparse\_gui.Option attribute), 46
- TYPES (pymodis.optparse\_gui.Option attribute), 46
- TYPES (pymodis.optparse\_required.OptionWithDefault attribute), 45
- U**
- urljoin() (in module pymodis.downmodis), 31
- UserCancelledError, 47
- V**
- valBound() (pymodis.parsemodis.parseModisMulti method), 36
- valBrowseProduct() (py-modis.parsemodis.parseModisMulti method), 36
- valCollectionMetaData() (py-modis.parsemodis.parseModisMulti method), 36
- valDataCenter() (py-modis.parsemodis.parseModisMulti method), 36
- valDataFiles() (py-modis.parsemodis.parseModisMulti method), 36
- valDataGranule() (py-modis.parsemodis.parseModisMulti method), 36
- valDbID() (pymodis.parsemodis.parseModisMulti method), 37
- valDTD() (pymodis.parsemodis.parseModisMulti method), 36

`valGranuleUR()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valInputPointer()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valInsertTime()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valInsTime()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valLastUpdate()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valMeasuredParameter()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valPGEVersion()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valPlatform()` (py-modis.parsemodis.parseModisMulti method), [37](#)

`valPSA()` (pymodis.parsemodis.parseModisMulti method), [37](#)

`valRangeTime()` (py-modis.parsemodis.parseModisMulti method), [37](#)

## W

`write_mosaic_xml()` (py-modis.convertmodis.createMosaic method), [39](#)

`write_mosaic_xml()` (py-modis.convertmodis\_gdal.createMosaicGDAL method), [42](#)

`write_vrt()` (pymodis.convertmodis\_gdal.createMosaicGDAL method), [42](#)

`writexml()` (pymodis.parsemodis.parseModisMulti method), [37](#)