# Automation of the RGB process using MODIS 250 m data

Creating MODIS RGB images are described in ***Exercises_modis_250m.pdf*** and ***Exercises_modis_250m_short.pdf***. It is time consuming to manually create the *crefl* control file for atmospheric correction and manually run the correct commands. Here we describe how to automate the process. After setting up the batch file and downloading the data files, all you need to do is to run a single batch file.

The whole process of creating MODIS RGB images includes the following steps.

Search for the data at https://ladsweb.modaps.eosdis.nasa.gov/search/

- In the "**Satellite/Instrument**" box select either *Aqua MODIS* or *Terra MODIS*.
- In the "**Group**" box select *Aqua Level 1 Products* (for Aqua) or *Terra Level 1 Products* (for Terra).
- In the "**Products**" window hold down the Control key and select with mouse pointer the following products: **MYD021KM**, **MYD0HKM**, **MYD0QKM**, **MYD03** (for Aqua) or **MOD021KM**, **MOD0HKM**, **MOD0QKM**, **MOD03** (for Terra), i.e. the files with 1 km, 500 m, 250 m and geo-location products, respectively.
- Type in the search parameters in the "**Temporal Selection**" and/or "**Spatial Selection**" boxes. . I recommend using *Ocean Color Level 1 and 2 Browser* http://oceancolor.gsfc.nasa.gov/cgi/browse.pl?sen=am to find the good passes, writing down the date and time and then using these to search by exact date and time in the "**Temporal Selection**" box. As the exact time defines the swath granule and its spatial location, you don't need to select any spatial location! For example, I found out that there was a good Aqua file from April 30, 2014 with filename A2014120211000*.*. I then typed "04/30/2014 21:10:00" into the ***Start Date and Time*** and typed "04/30/2014 21:10:59" into the ***End Date and Time***. I left all other boxes at their default values and clicked ***Search*** at the bottom of the page. I received a list of 4 files corresponding to the scene that I was searching for.
- Note: you also need to select a "Collection", currently 6 or 6.1.
- The best way to find files when you know the date and time is using the **Filename Search** button along the left edge at LADSWEB), I recommend creating a text file like this:

  MYD021KM.A2013044.1925*
  MYD02HKM.A2013044.1925*
  MYD02QKM.A2013044.1925*
  MYD03.A2013044.1925*

  For your files, of course, you have to replace the year, year day, time with your values. Then paste the text into the search window at https://ladsweb.modaps.eosdis.nasa.gov/search/locate, click **Search** and download the files by clicking on the **Download** button.

- You can download the files by clicking on them. For downloading many files it may be better to create a shopping cart and then download the whole set of files. Download the 4 files to your working directory, e.g. *C:\tmp*. For systematic work I recommend making separate directories for MODISA and MODIST and use subdirectories in the form of YYYY_DDD under these. E.g., I downloaded the 4 Aqua files of April 30, 2014 (i.e. year day 120) to *G:\MODISA\Cal\2014_120*. Here *Cal* is my area of interest. You may have more than one areas of interest; therefore keep separate areas under separate directories. For the corresponding MODIS-Terra directory I would use *G:\MODIST\Cal\2014_120*.
- **After** you have set up the batch process, you can generate all RGB products with a single batch file ***rgb_modis_all.bat*** . You need to copy this file to the working directory. Note: **Do not move**

**this file, make a new copy!** You can copy this file from the *Wimsoft* folder (e.g. C:\Program Files (x86)\Wimsoft) to your data directory. Examine what is in that batch file (with a text editor like Notepad); so that you can edit it and adapt it for your needs!

- Open the command window in the working folder with your data files, e.g. with *Shift-Right Click* and select ***Open command window here*** or use *Start-Run* type *cmd* and change directory to where your files are, e.g. in my case *cd G:\MODISA\Cal\2014_120*. Learn to use the fast way of opening the command window by holding down the Shift key and right-clicking on the directory name and then selecting *Open command window here*. This will save you a lot of time!

- Test that the WIM/WAM executable programs are accessible; type a name of any WIM/WAM executable, e.g. *wam_rgb_modis*. You should see the command syntax. If you do not see the syntax then the path is not set correctly and you need to fix that now.

- Type in the command window: ***makelistcrefl   .\***   Note the **.\** in the end. This means that you want to match those 4 Level1B files that are in the current directory. (You can create the *crefl* control files in another directory (e.g. *DIRECTORY*) if you can type *makelistcrefl  DIRECTORY*).

- This will create 3 separate command files for *crefl* (for 1km, 500 m and 250 m options). You don't need any manual editing! Check that you have 3 new text files in the folder.

- Now you can run the atmospheric correction by running *crefl* three times with a single batch file by typing ***crefl_all***.

- You can now create the default full extent 1-km RGB image by typing:
  *wam_rgb_modis *.1km_cref.hdf*
  After it is done, you can view the 1-km PNG image or load the 1-km RGB HDF image into WIM. This is the basic form of running *wam_rgb_modis* that uses all default options. To see all the options type the name of the command (*wam_rgb_modis*) without arguments.  For example, the default option is to use the full range of 0 to 255 for each of the R, G and B bands. The full range is good for bright land features. To highlight less bright ocean features you can stretch the RGB ranges and specify different ranges depending on what features you want to highlight. Also, you can save all the bands and experiment with WIM to find the best color ranges.

- Create a new 1-km RGB image(s) by typing:
  *wam_rgb_modis *.1km_cref.hdf 0 140 0 140 0 140 yes*
  This specifies the same color range from 0 to 140 for the Red, Green and Blue components. Instead of 140 you can specify other numbers between 0 and 255. The command also specifies ("yes") to save the 3-band file that you can use to tune the color range for the next step. After it is finished, load the 3 images from *_3bands.hdf* file into WIM and find the best color range for each band with *Examine – RGB Image*. Use the MOD03 or MYD03 file for geo-location. Make sure that you load the correct bands for the R, G and B components.

- After you pick the desired color ranges for the image, you can apply these to the full resolution image at 250 m resolution by typing (X, Y, Z are respectively the upper limits for Red, Green and Blue, respectively, e.g. 140, 140, 140)::
  *wam_rgb_modis *.250m_cref.hdf 0 140  0 140 0 140*

- When studying a certain feature or particular area you will probably want to have multiple RGB images of the same area and in the same projection.  You need to create a target projection file and then map all the RGB images to the same projection. For example,
   *wam_rgb_modis *.250m_cref.hdf 0 220 0 220 0 220 no target.hdf*
  will not save  the individual bands (**no** option instead of **yes**) but will map the RGB image to the projection in *target.hdf*. Of course, you need to have a target projection file.

- The provided batch file ***rgb_modis_all*** will do all that. It will first run *makelistcrefl*, then call *crefl_all*, then run *wam_rgb_modis* with specified parameters for 1 km, 250 m and 4 km maps and finally overlay the map coastline boundaries on the RGB images. The mapped 4-km resolution image is like a thumbnail that can be used on websites or documents with a hyperlink to either the 1-km or 250-m resolution images. In order to get the full power of ***rgb_modis_all***

you need to create these 3 target projection files, and edit the batch file *rgb_modis_all.bat* by changing the names of the target map files. If you do not want all the 3 versions, you can simply disable that option by preceding that line with **REM** followed by space. This means that this line is commented out (i.e. it is a remark).

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**In summary**, after you set up the batch file ***rgb_modis_all.bat***, all you need to do is to download the 4 files and then run this single batch file. It will be really handy when you need to do this process many times. Below is a subset of the result showing smoke from a fire between Rosarito and Ensenada in Baja California, Mexico, upwelling of green waters off the coast and sun glint offshore.