

MRTWeb

User's Manual

Release 1.0
June 2, 2008

Land Processes DAAC
USGS Earth Resource Observation and Science (EROS) Center

Introduction

MODIS land product tiles (figure 1) are stored at the Land Processes Distributed Active Archive Center (LP DAAC) in a standard 10 x 10 degree extent, Sinusoidal projection, and HDF-EOS format. Based on needs expressed in user feedback to the LP DAAC, the MODIS reprojection tool web interface (MRTWeb) was developed to provide enhanced, web-based discovery and delivery services for MODIS land tiles archived in the LP DAAC. This guide covers the MRTWeb 1.0 external beta release during the period June 2, 2008 to August 1, 2008.

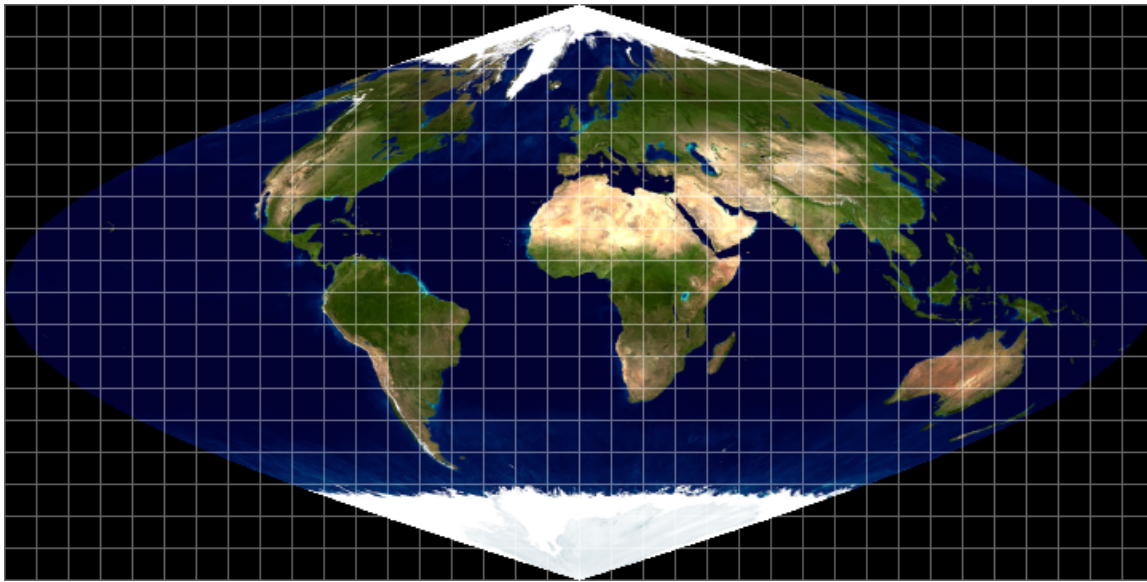


Figure 1. A global representation of standard MODIS land product tiles.

MRTWeb 1.0 combines familiar capabilities of the USGS Global Visualization Viewer (GloVis) and the downloadable MODIS Reprojection Tool (MRT). The MRTWeb interface combines and modifies the pre-existing GloVis and MRT layouts into three main tabs: Selection, Process, and Download. Functions available through these tabs allow the user to:

- Find / Visualize / Select tiles of interest
- Choose bands or layers (Science Data Sets in HDF terminology) of interest
- Mosaic multiple adjacent tiles from same date (and subset to an area of interest if desired)
- Subset an area of interest from multiple dates of the same tile (time series extraction)
- Set projection (currently limited to Albers Equal Area, Geographic, Lambert Azimuthal, Polar Stereographic, Sinusoidal, and UTM)
- Set resampling (currently limited to Nearest Neighbor, with native, 250-, 500-, and 1000-meter griddings)
- Choose output format (currently limited to HDF-EOS, GeoTiff, and Raw Binary)
- Submit processing job(s) to LP DAAC
- Monitor progress of processing job(s)
- Download customized MODIS datasets and processing logs
- Exit the interface and login later to check job status and/or download datasets

Submitted jobs are run with MRT 4.0 processing software across multiple servers at the LP DAAC. Output datasets are staged on a job-specific ftp directory for user download. No media options are available with MRTWeb.

The MRTWeb target audience is intermediate to expert users of MODIS land data. Knowledge of MODIS land product characteristics and general image processing techniques is assumed. MRTWeb is not intended as a method for acquiring very large volumes of data from the archive. The scope of this document does not include detailed explanations of file formats, projection considerations, or any of the underlying image processing concepts and code used in developing the MRT 4.0 processing software. For more detail, users are referred to existing documentation: http://lpdaac.usgs.gov/landdaac/tools/modis/info/MRT_Users_Manual.pdf

Available Data

MRTWeb acts on a subset of the full LP DAAC MODIS land data archive that resides on spinning disk (i.e., the LP DAAC data pool). The LP DAAC data pool is currently in transition. MODIS collection 4 files have been removed, storage volumes are being added, and large numbers of collection 5 files are being transferred to spinning disk from the tape archive. The vast majority of collection 5 tiles will be available to MRTWeb in the near future (and prior to its full public release). For the current MRTWeb 1.0 beta release, we have exposed a limited temporal range (2007 – present) and product suite (table 1) from the current data pool holdings.

Shortname	MODIS Product	Platform	Level	Spatial Resolution (m)	Temporal Granularity
MCD43B1	BRDF / Albedo - Model Parameters	Combined	3	1000	16-day Composite
MCD43B3	Albedo	Combined	3	1000	16-day Composite
MCD43B4	Nadir BRDF- Adjusted Reflectance	Combined	3	1000	16-day Composite
MOD09A1	Surface Reflectance Bands 1-7	Terra	3	500	8-day Composite
MOD11B1	Land Surface Temperature / Emissivity	Terra	3	6000	Daily
MOD13A1	Vegetation Indices	Terra	3	500	16-day Composite
MOD13A2	Vegetation Indices	Terra	3	1000	16-day Composite
MOD14A1	Thermal Anomalies / Fire	Terra	3	1000	Daily
MOD14A2	Thermal Anomalies / Fire	Terra	3	1000	8-day Composite
MOD15A2	Leaf Area Index / fPAR	Terra	4	1000	8-day Composite
MYD09A1	Surface Reflectance Bands 1-7	Aqua	3	500	8-day Composite
MYD13A1	Vegetation Indices	Aqua	3	500	16-day Composite
MYD13A2	Vegetation Indices	Aqua	3	1000	16-day Composite
MYD14A1	Thermal Anomalies / Fire	Aqua	3	1000	Daily
MYD14A2	Thermal Anomalies / Fire	Aqua	3	1000	8-day Composite
MYD15A2	Leaf Area Index / Fraction of Photosynthetically Active Radiation	Aqua	4	1000	8-day Composite

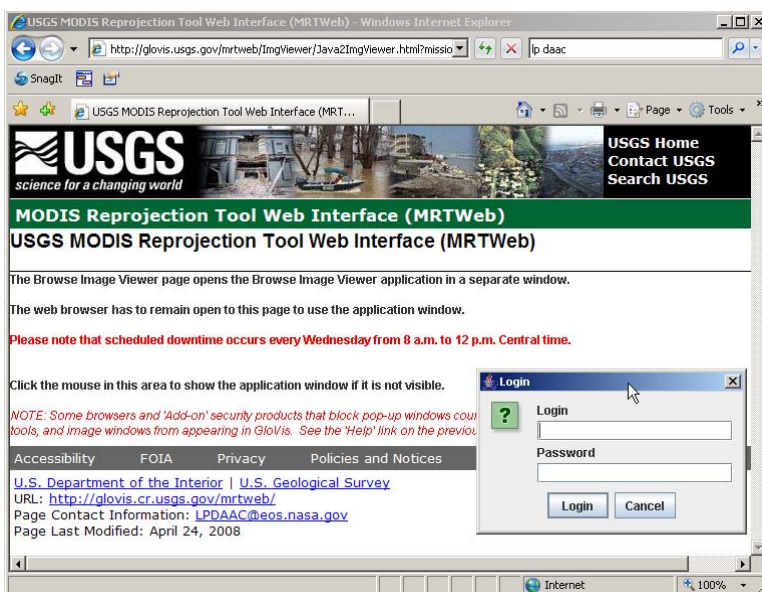
Table 1. MODIS products exposed from the LP DAAC data pool for MRTWeb 1.0 beta testing.

Getting Started

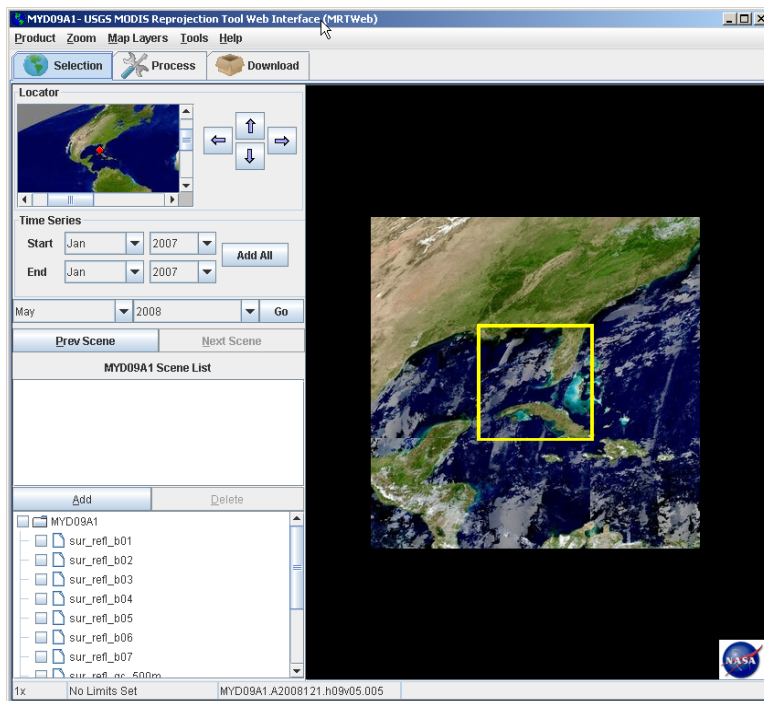
MRTWeb 1.0 is an external beta release. We thank those users who have agreed to participate in testing this release and giving their feedback. Beta testers have been provided login and password information, and can access MRTWeb from <http://glovis.usgs.gov/mrtweb/>. Make sure pop-ups are not blocked by your browser for this site.



Use the MRTWeb entry point (glovis.usgs.gov/mrtweb) to **select a product** (e.g. MODIS Aqua MYD09A1) and **click on the map** (e.g., on Florida) to bring up the login dialog box.



Submit your login and password when prompted.



The MRTWeb 1.0 graphical user interface will appear in a new window.

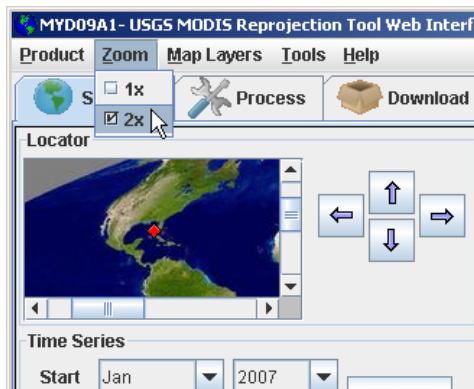
You are now ready to begin with the Use Cases.

Uses Cases

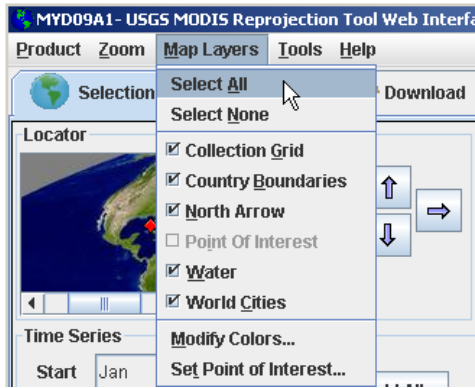
Three use cases are provided to give users experience with important functions and components of MRTWeb 1.0. Users are encouraged to follow the use cases in sequence and then apply the knowledge gained to create their own customized processing jobs. Those already very familiar with GloVis and MRT can skip the Use Cases, but should read the *Further Guidelines for Beta Testers* section at the end of this document before proceeding.

Use Case 1: Select a cloud-free tile and change its format

The first use case assumes that the user is looking at the MODIS Aqua MYD09A1 product for Florida (as above).

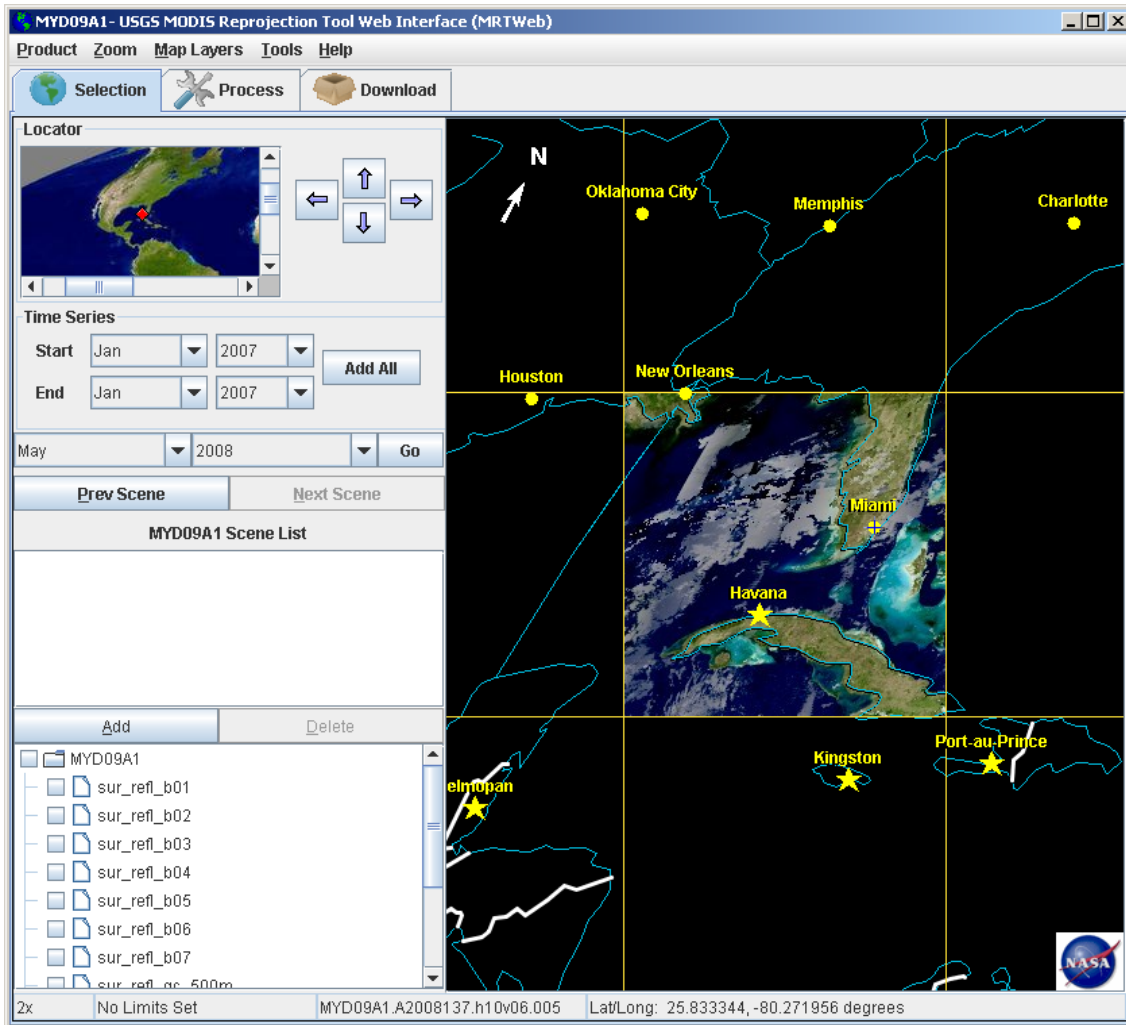


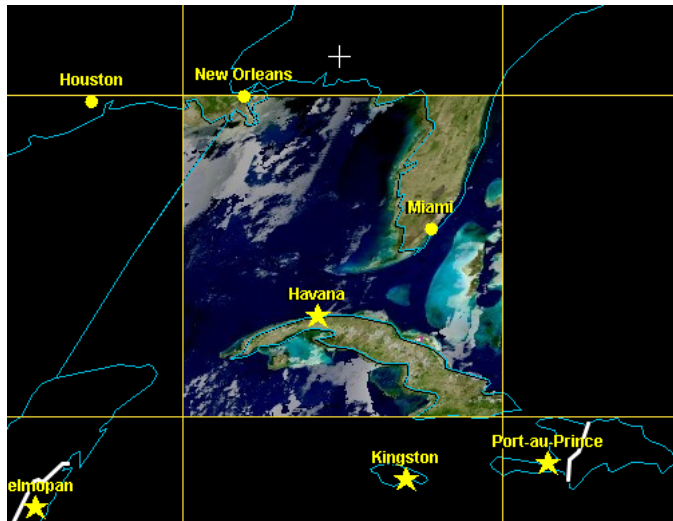
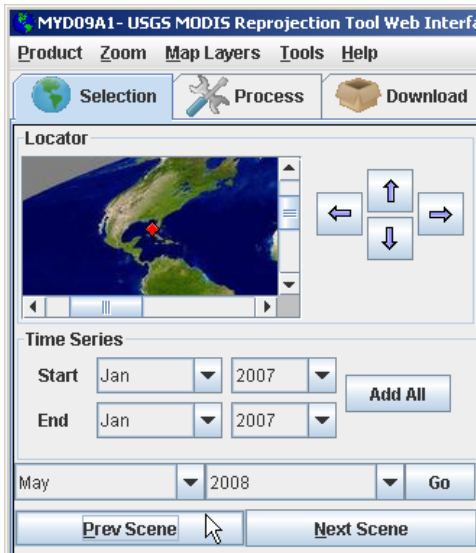
- 1.1 Use the Zoom drop-down on the main toolbar to zoom in closer (x2). This gives a closer look at the browse image for the product of interest. MRTWeb always displays the most recent available browse at the time of use.



1.2 Use the Map Layers drop-down on the main toolbar to select all map layers. Map layers give spatial context to the MODIS land product browse images.

1.3 The MRTWeb GUI at Zoom Level x2 and all Map Layers selected. Notice that the product (MYD09A1), year (2008), Julian day (137 at this writing), tile coordinate (h10v06), and version (005) of the most recent browse image are displayed in the status bar at the bottom of the MRTWeb GUI. The status bar also gives the geographic coordinates of your cursor as you scan across the browse image (e.g., over Miami).

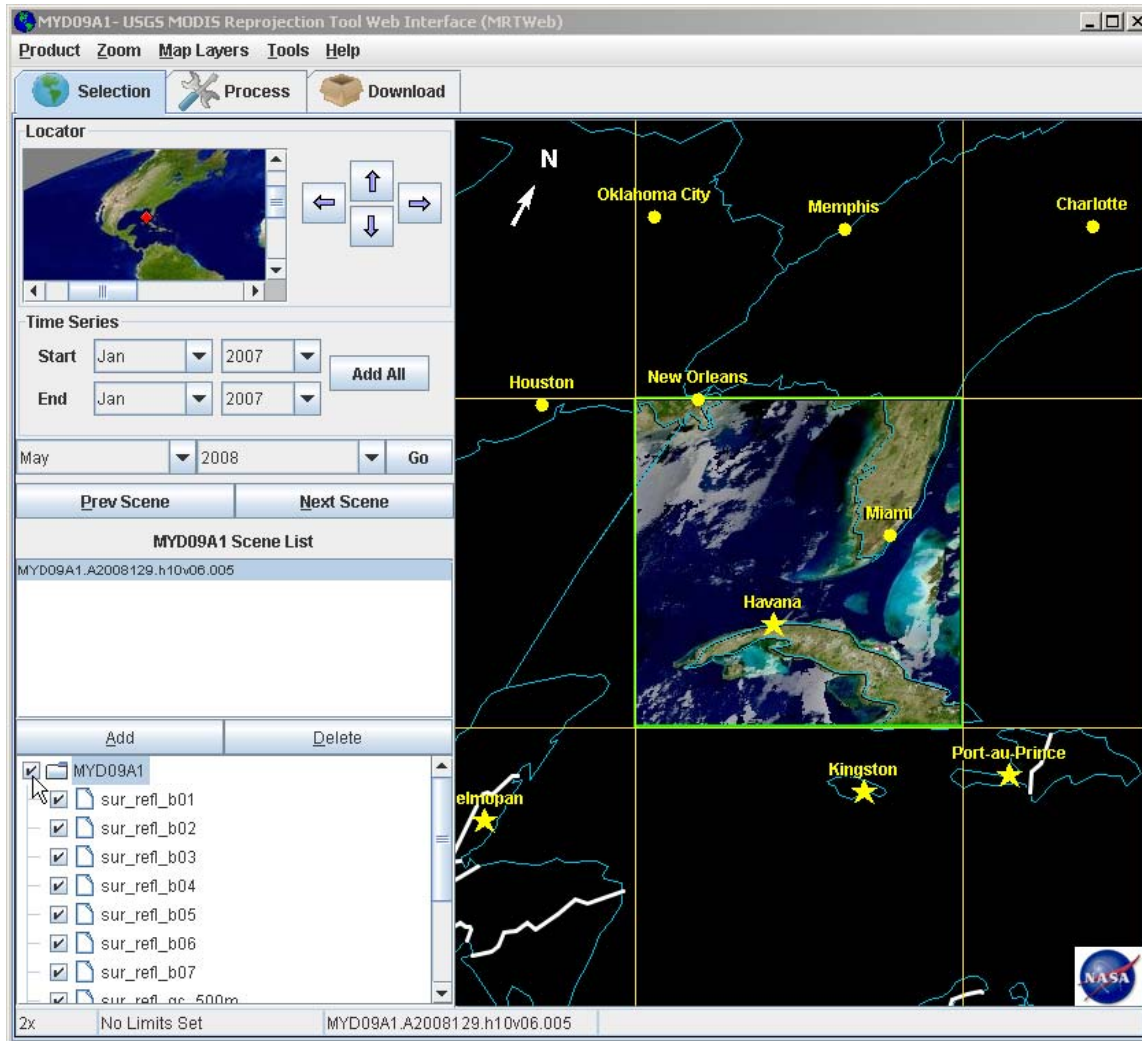




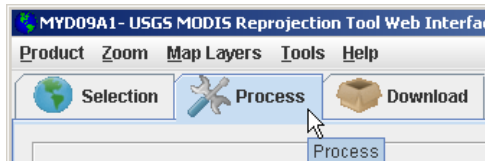
1.4 Click the **Prev Scene** button to browse back through time. Click the **Next Scene** button to browse forward through time. Browse until you are looking at a relatively cloud-free MODIS land product tile (e.g., MYD09A1.A2008129.h10v06.005).



1.5 Click on the **Add** button underneath the MYD09A1 Scene List to add the tile to the scene list. This is the only tile selected for this processing job, as indicated by the single entry in the scene list.



1.6 Click on the *MYD09A1* check box in the band list to select all MYD09A1 layers from this tile for inclusion in the processing job. A check mark next to each layer indicates that all bands and/or layers have all been selected for processing.



1.7 Click on the **Process Tab to change from the selection screen to the processing options screen in the MRTWeb 1.0 GUI.**

The screenshot shows the 'MYD09A1-USGS MODIS Reprojection Tool Web Interface (MRTWeb)' window. It features a menu bar with 'Product', 'Zoom', 'Map Layers', 'Tools', and 'Help'. Below the menu is a toolbar with 'Selection', 'Process', and 'Download' buttons. The main interface is divided into several sections: 'Processing Type' with a dropdown menu set to 'Convert Format'; 'Job Name' with a text input field containing 'FloridaReformat' and a note '(use only alphanumeric characters)'; 'Spatial Subset' with a dropdown menu and four input fields for 'Upper Left', 'Latitude', 'Longitude', and 'Lower Right'; and 'Output' with a 'File Type' dropdown set to 'GEOTIFF' and a 'Process' button.

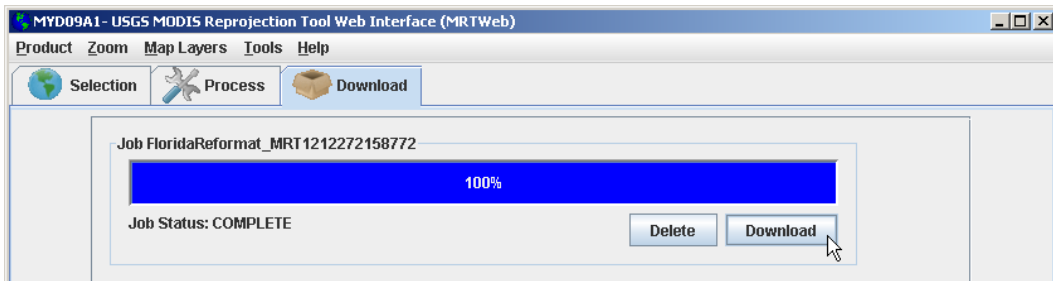
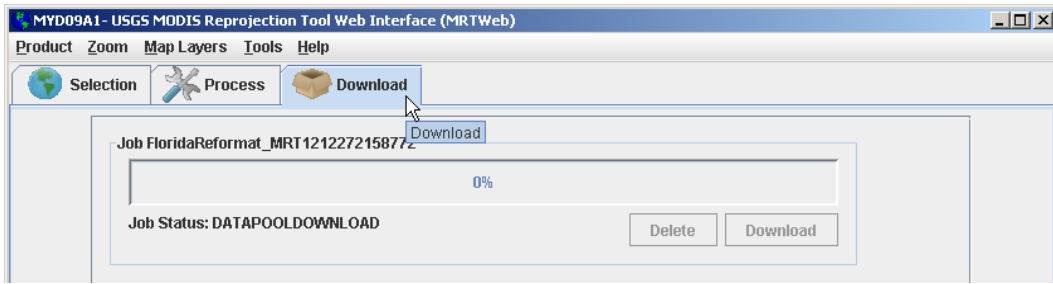
1.8 Set the processing options as follows (and shown above):

- Set the processing type to Convert Format
- Enter a name in the Job Name field (e.g., FloridaReformat).
- Leave the Spatial Subsetting parameters empty (the full tile extent will be processed)
- Set the Output File Type to GEOTIFF.

1.9 Click on the Process button to initiate the reformatting job on LP DAAC servers.

Click the OK button on the job notification pop-up message to acknowledge that the processing job has been submitted.





1.10 Click on the Download Tab to change from the processing options screen to the job monitoring and download screen. The job status message will initially indicate that the tile is moving from the Data Pool to the staging area. As soon as the tile is staged and reformatting begins, the status bar will begin showing the progress of your job. When the job has completed, **click the Download button** to spawn an FTP directory viewer.



1.11 Download the individual .tif files from the FTP directory to a directory on your local file system. The standard HDF file used in your processing job is available as well, but you do not have to download it. The MRT 4.0 log and parameter files are also available for download. You can download these text files to capture a record of your processing job.

A grayscale image of *MYD09A1.A2008129_1.sur_refl_b01.tif* (an output band file from this use case) is shown in figure 2 below. The native tile extent and projection have not been altered, only the file format has been changed.

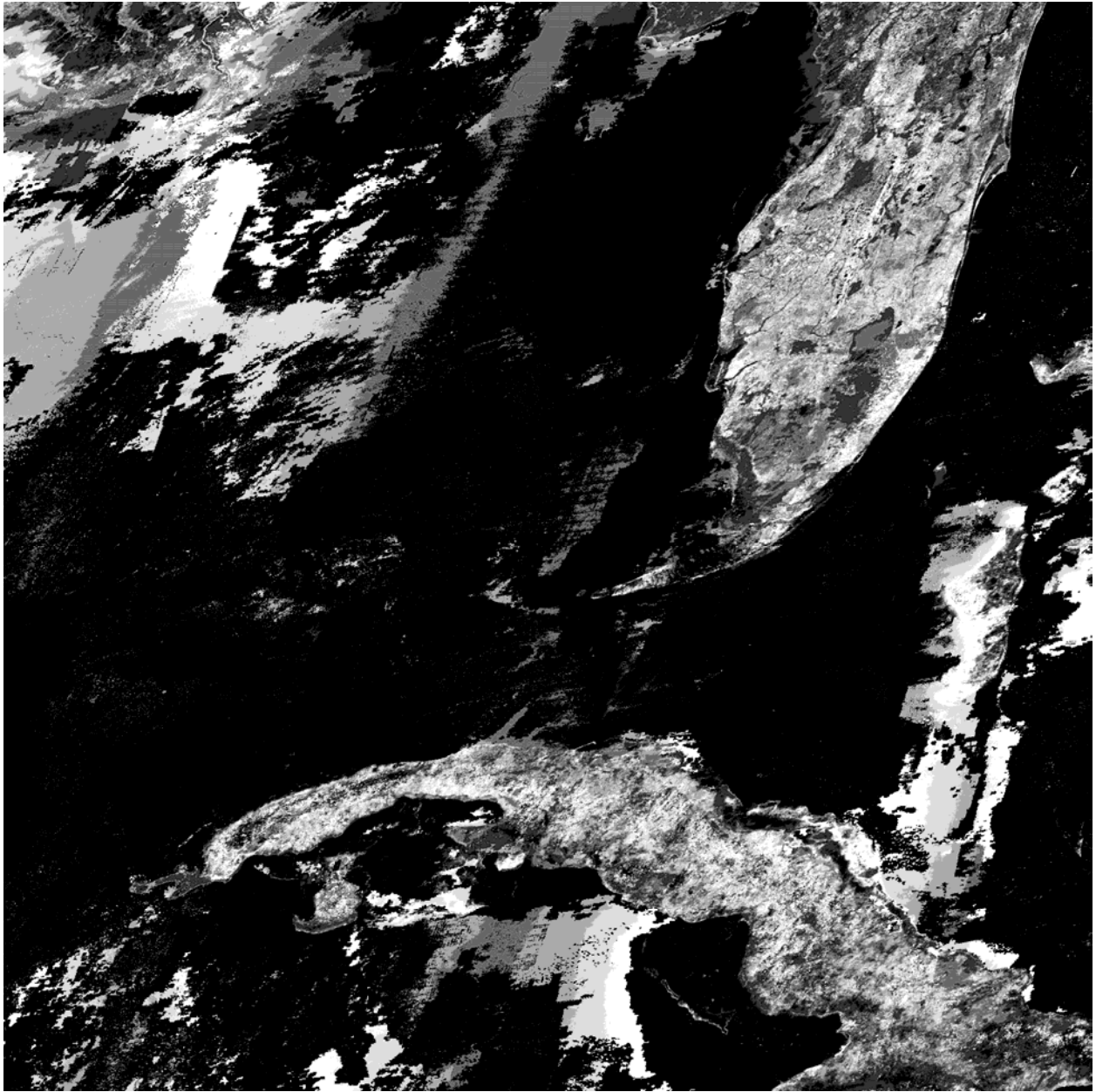
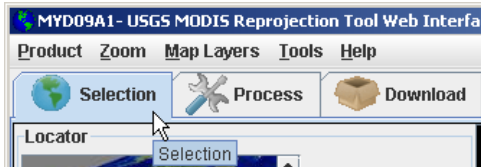
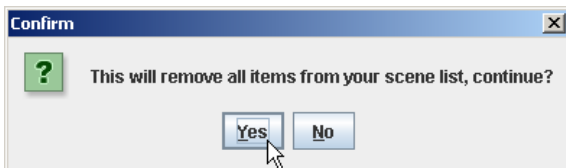
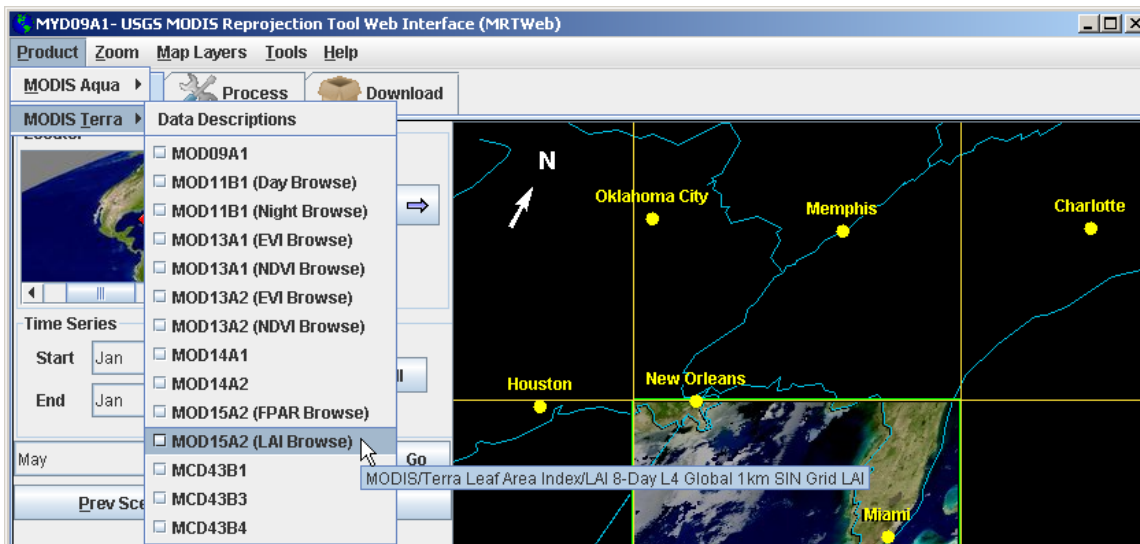


Figure 2. A grayscale image of *MYD09A1.A2008129_1.sur_refl_b01.tif*.

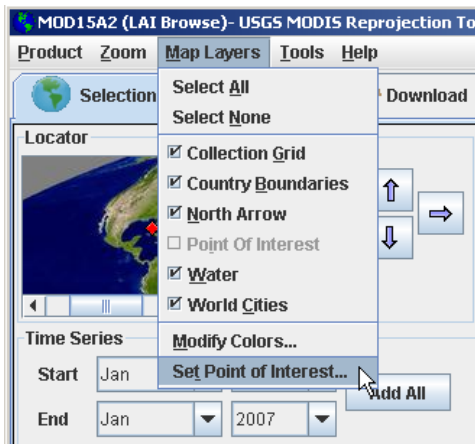
Use Case 2: Extract a one-year time series, including elimination of unwanted layers, reprojection, spatial subsetting, and reformatting.



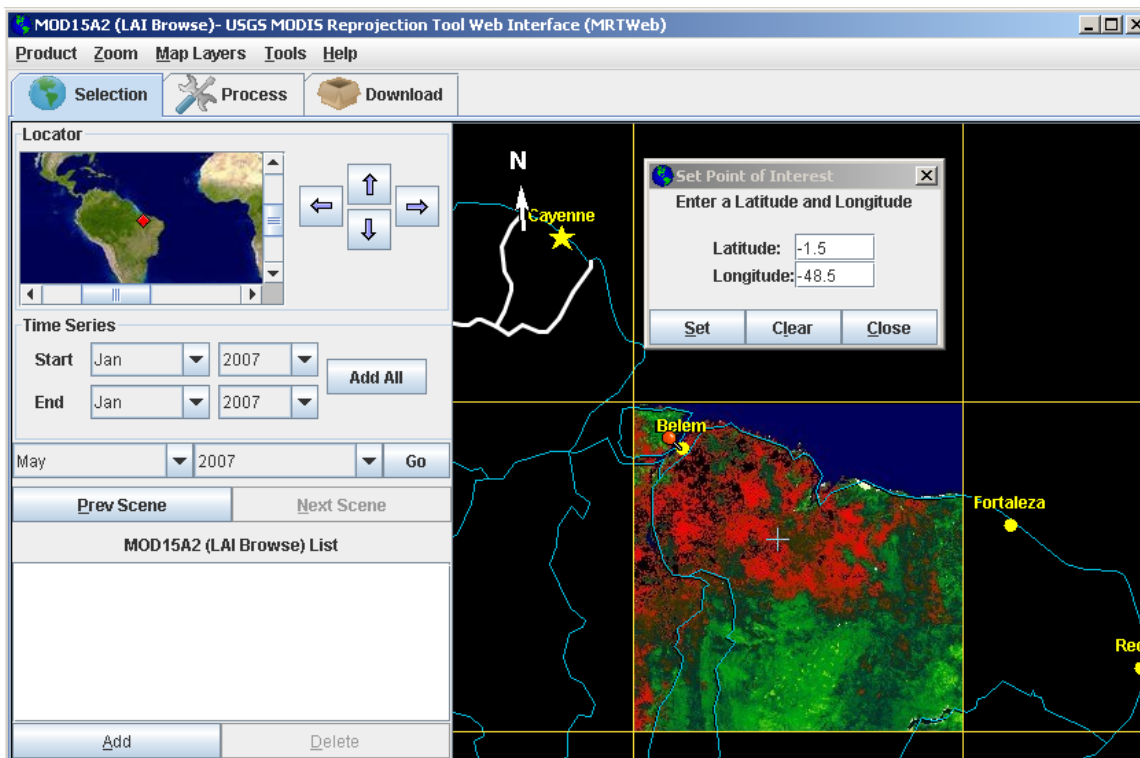
2.1 Click the Selection Tab to change from the download screen back to the selection screen.



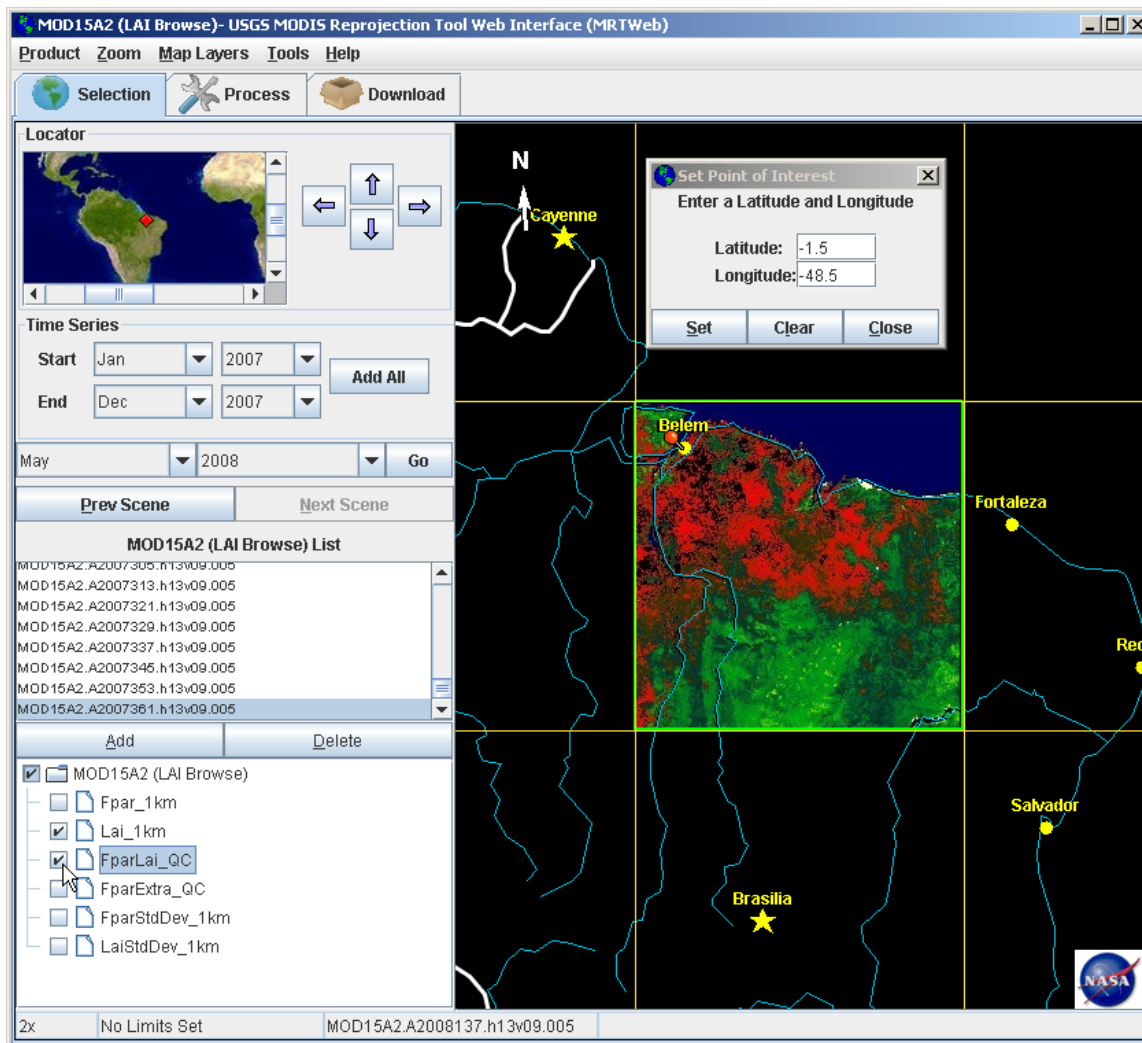
2.2 Use the Product drop-down menu on the main toolbar to select the MOD15A2 product. Click Yes on the confirmation pop-up to clear your scene list and display the MOD15A2 browse. The scene list will be cleared anytime you switch products.



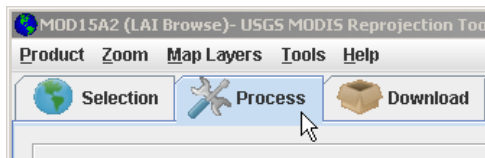
2.3 Use the Map Layers drop-down menu on the main toolbar to select Set Point of Interest. A small dialog box will pop up. Enter -1.5 for Latitude and -48.5 for Longitude and click set. The point of interest appears as a pin in the MRTWeb browser window (in this case, corresponding to Belem, Brazil).



2.4 Use the Time Series controls to select and add one year of MOD15A2 tiles to the scene list. Set time series Start month/year to Jan/2007 and End month/year to Dec/2007. Click Add All and all tiles from 2007 will be added to the scene list.



2.5 Click on the check box for *Lai_1km* and *FparLai_QC* in the band list to select only the Leaf Area Index and main Quality Control layers for this product. A check mark indicates that the layers of interest have been selected for processing.



2.6 Click on the Process Tab to change from the selection screen to the processing options screen in the MRTWeb 1.0 GUI.

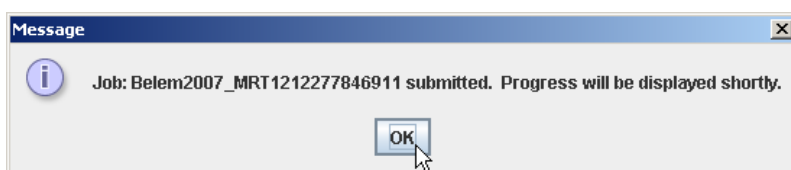
The screenshot shows the 'MOD15A2 (LAI Browse)- USGS MODIS Reprojection Tool Web Interface (MRTWeb)'. The interface includes a menu bar with 'Product', 'Zoom', 'Map Layers', 'Tools', and 'Help'. Below the menu are three tabs: 'Selection', 'Process', and 'Download'. The 'Process' tab is active, showing the following configuration:

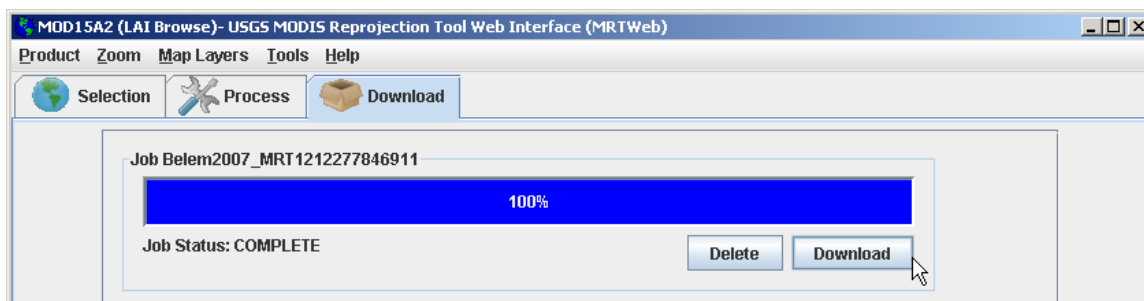
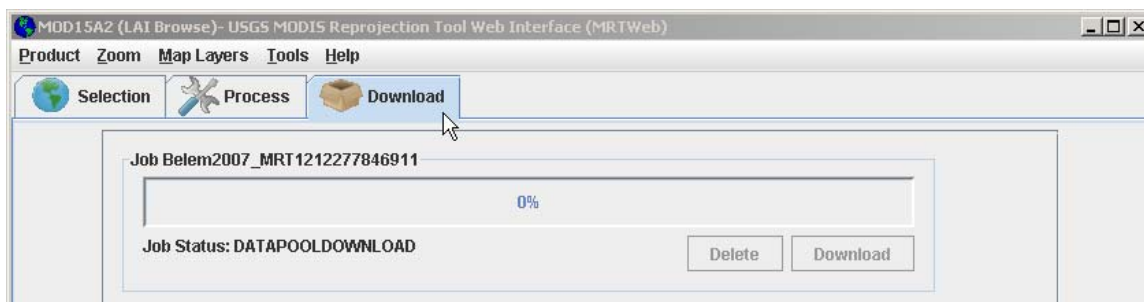
- Processing Type:** Reproject
- Job Name:** Belem2007 (with a note: 'use only alphanumeric characters')
- Spatial Subset:** Input Lat/Long. Upper Left: -0.5 (Longitude), -49.5 (Latitude). Lower Right: -2.5 (Longitude), -47.5 (Latitude).
- Resampling:** Type: Nearest Neighbor; Pixel Size: Native pixels.
- Projection:** Geographic; Datum: WGS84.
- Output:** File Type: GEOTIFF.

A 'Process' button is visible at the bottom right of the configuration area.

2.7 Set the processing options as follows (and shown above):

- Set the Processing Type to Reproject.
- Enter a name in the Job Name field (e.g., Belem2007).
- Set the Spatial Subset Input Lat/Long
- Enter -0.5, -49.5 (Lat/Long) for the Upper Left and -2.5, -47.5 (Lat/Long) for the Lower Right spatial subset to define a 2 degree by 2 degree area of interest.
- Set the Resampling options to Nearest Neighbor and Native Pixel Size
- Leave output file type set to GEOTIFF.
- Click on the Process button to initiate the processing job on LP DAAC servers. Click the OK button on the job notification pop-up message to acknowledge that the processing job has been submitted.

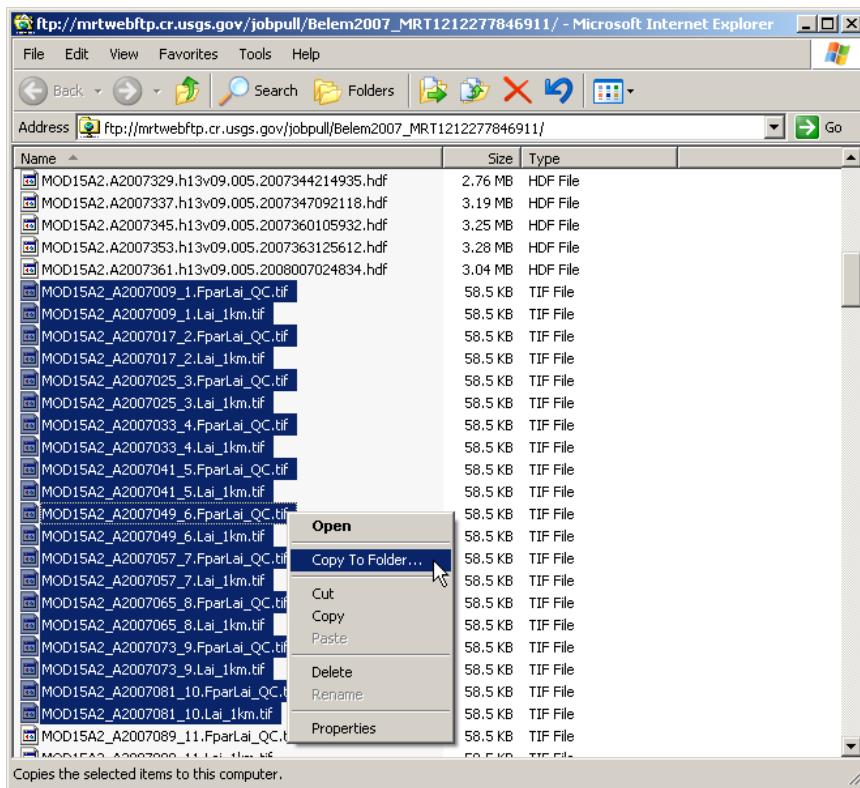




2.8 Click on the Download Tab to change from the processing options screen to the job monitoring and download screen. The job status message will initially indicate that the tiles are moving from the Data Pool to the staging area. As soon as the tiles are staged and processing begins, the status bar will begin showing the progress of your job. When the job has completed, **click the Download button** to spawn an FTP directory viewer.



2.9 Download the individual .tif files from the FTP directory to a directory on your local file system. Using the browser controls to open the directory as an FTP Site can facilitate downloading by making multiple file drag-and-drop capabilities available (as seen below). The standard HDF files used in your processing job are also staged, but you do not have to download them. The MRT 4.0 log and parameter files may be downloaded to capture a record of your processing job.



A grayscale image of *MOD015A2.A2007_1.Lai_1km.tif* (the first time series date subsetted from the LAI layer in this use case) is shown in figure 3. The subset corresponds to the two by two degree extent specified and is reprojected to geographic.

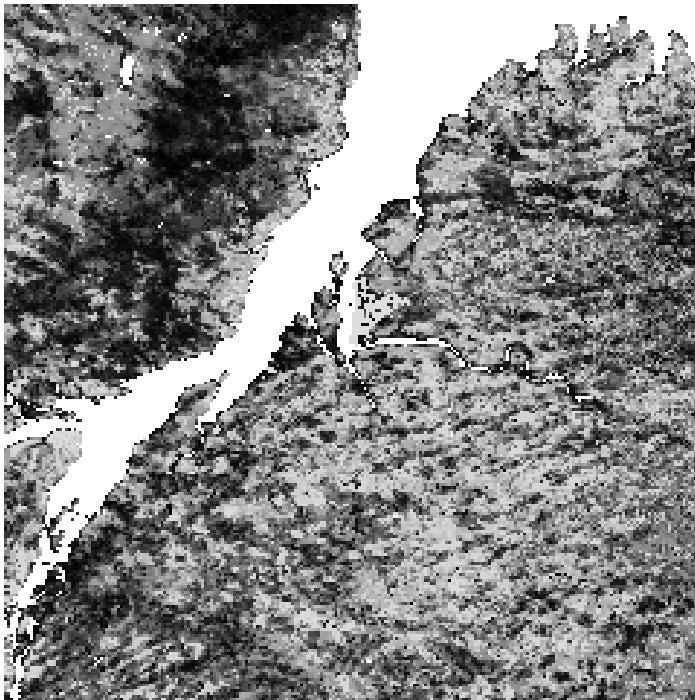
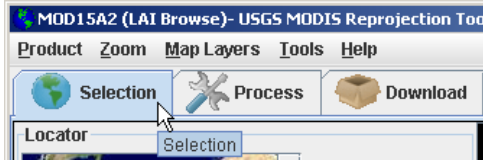
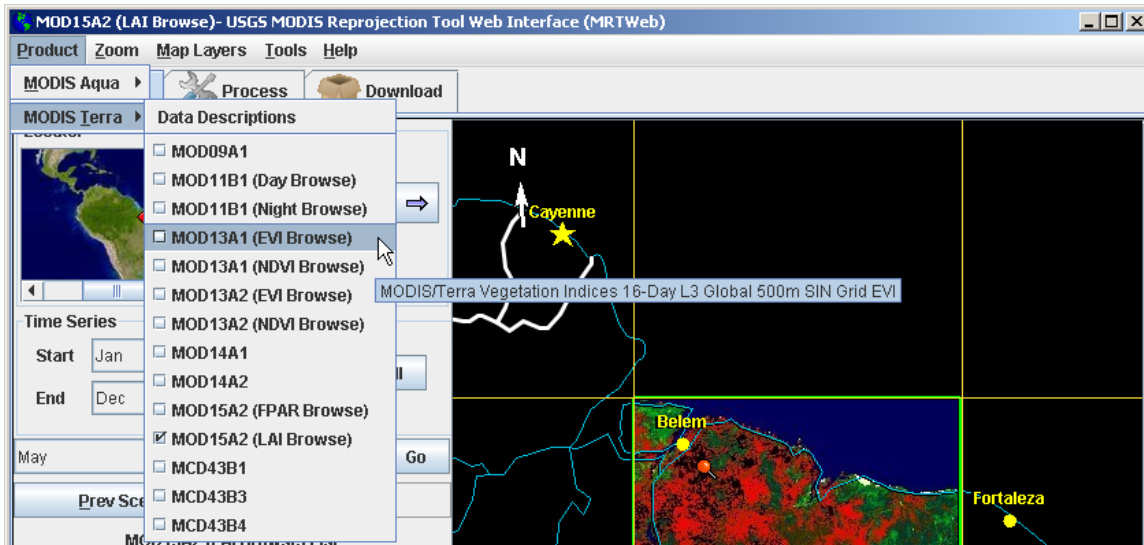


Figure 3. A grayscale image of *MOD015A2.A2007_1.Lai_1km.tif*.

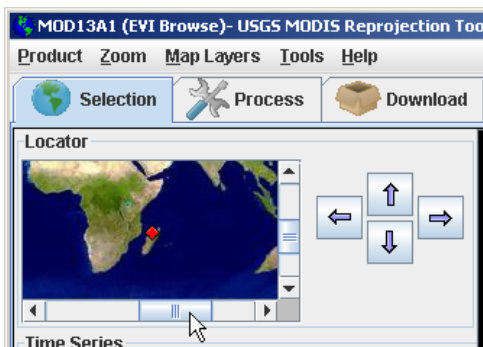
Use Case 3: Create a multi-tile mosaic, including elimination of unwanted layers, reprojection, spatial subsetting, and reformatting



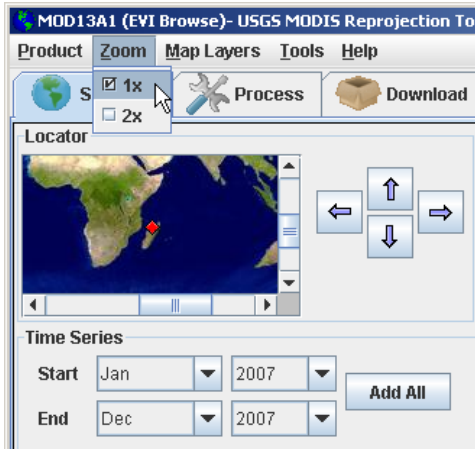
3.1 Click the Selection Tab to change from the download screen back to the selection screen.



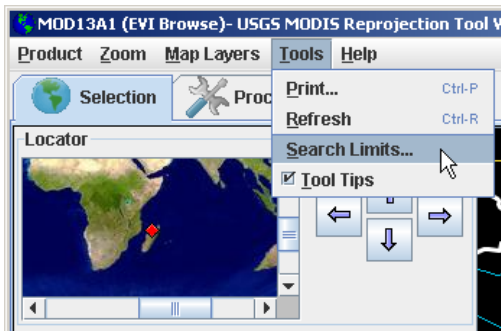
3.2 Use the Product drop-down menu on the main toolbar to select the MOD13A1 product (EVI browse). Click Yes on the confirmation pop-up to clear your scene list and display the MOD15A2 browse. The scene list will be cleared anytime you switch products.



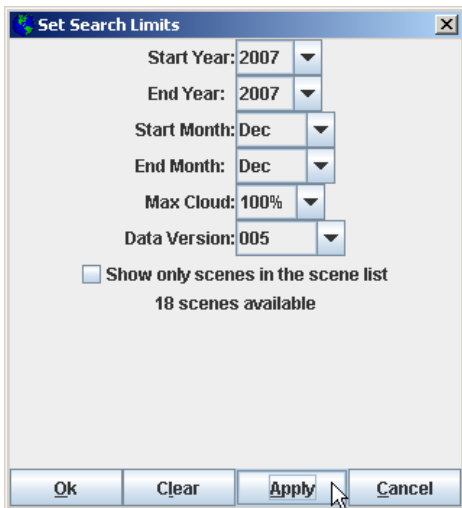
3.3 Use the Locator Controls to navigate to Madagascar. The slider bars reorient the locator map. Clicking on Madagascar sets the browse viewer to that location.



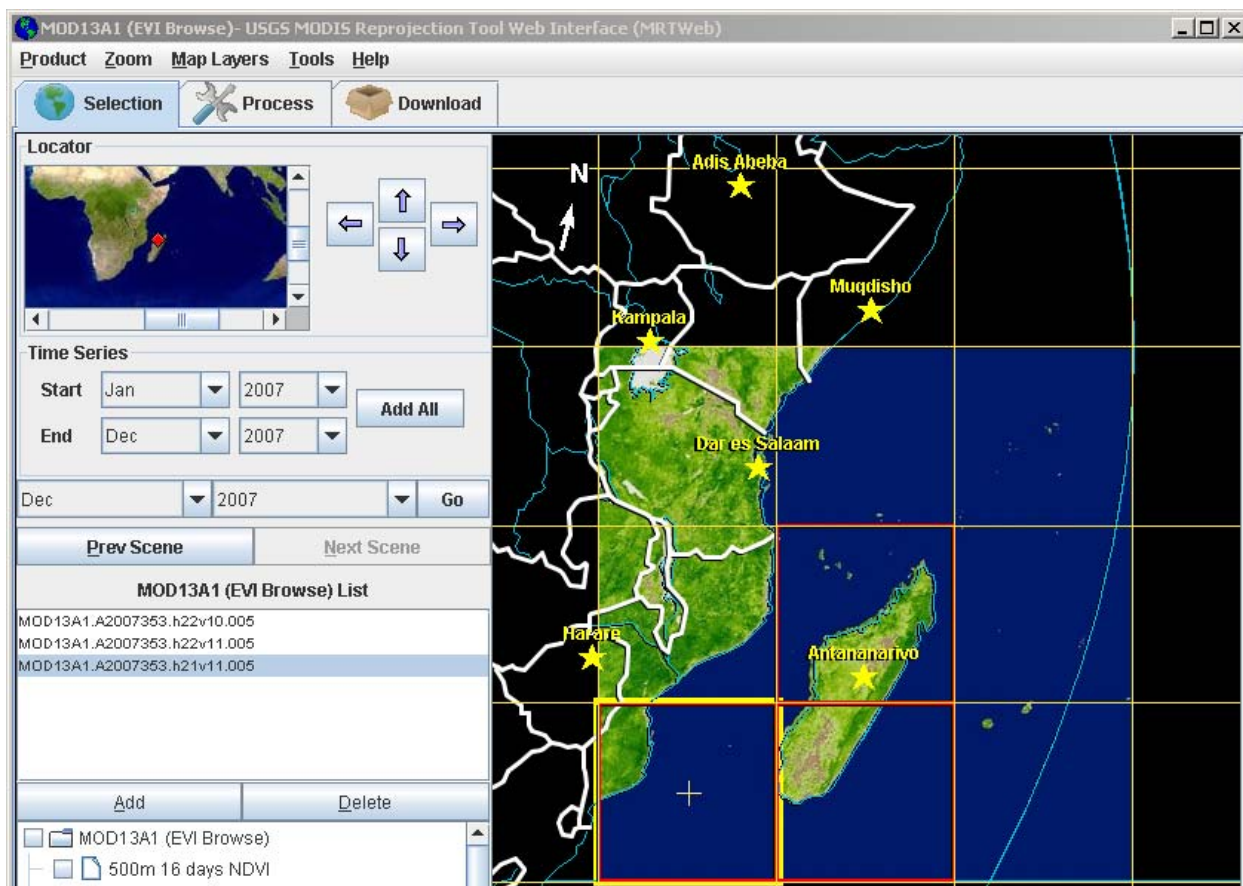
3.4 Use the Zoom drop-down on the main toolbar to zoom out (x1). This will show a group of nine browse images for the product of interest.



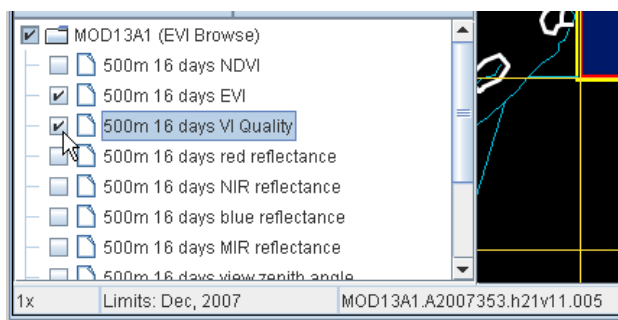
3.5 Use the Tools drop-down on the main toolbar to bring up the Search Limits dialog box.



3.6 Set and Apply Search Limits. This function constrains viewable browse images to the limits set by the user. In this case, set Start and End year to 2007 and Start and End Month to Dec.



3.7 Double-click on one of the tiles covering Madagascar. The tile is added to the scene list. Repeat until the three tiles shown above have been added to the scene list. Confirm that all tiles are from the same date. MRTWeb will automatically mosaic multiple tiles in the scene list as long as they are from the same date.



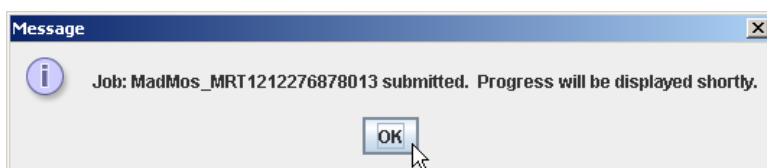
3.8 Click on the check box for 500m 16 days EVI and 500m 16 days VI Quality in the band list to select only the Enhanced Vegetation Index and main Quality layer for this product. A check mark indicates that the layers of interest have been selected for processing.

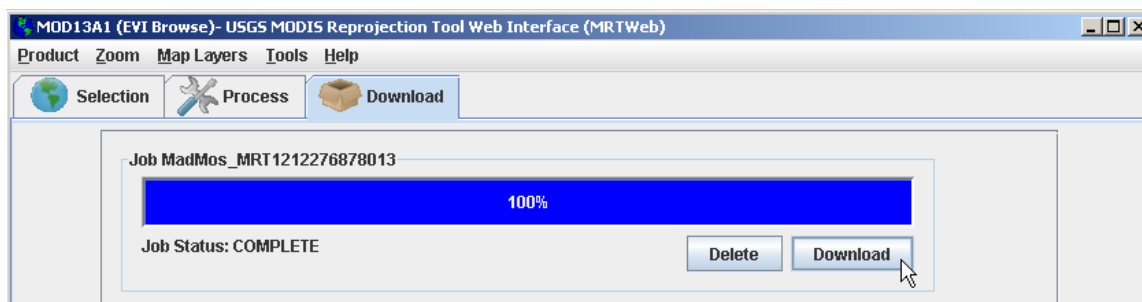
The screenshot shows the MRTWeb interface with the following settings:

- Processing Type:** Reproject
- Job Name:** MadMos (with a note: use only alphanumeric characters)
- Spatial Subset:** Input Lat/Long
 - Upper Left: -11.5 (Latitude), 42 (Longitude)
 - Lower Right: -26.5 (Latitude), 51 (Longitude)
- Resampling:** Type: Nearest Neighbor, Pixel Size: Native pixels
- Projection:** Geographic, Datum: WGS84
- Output:** File Type: GEOTIFF
- Action:** Process button is highlighted with a mouse cursor.

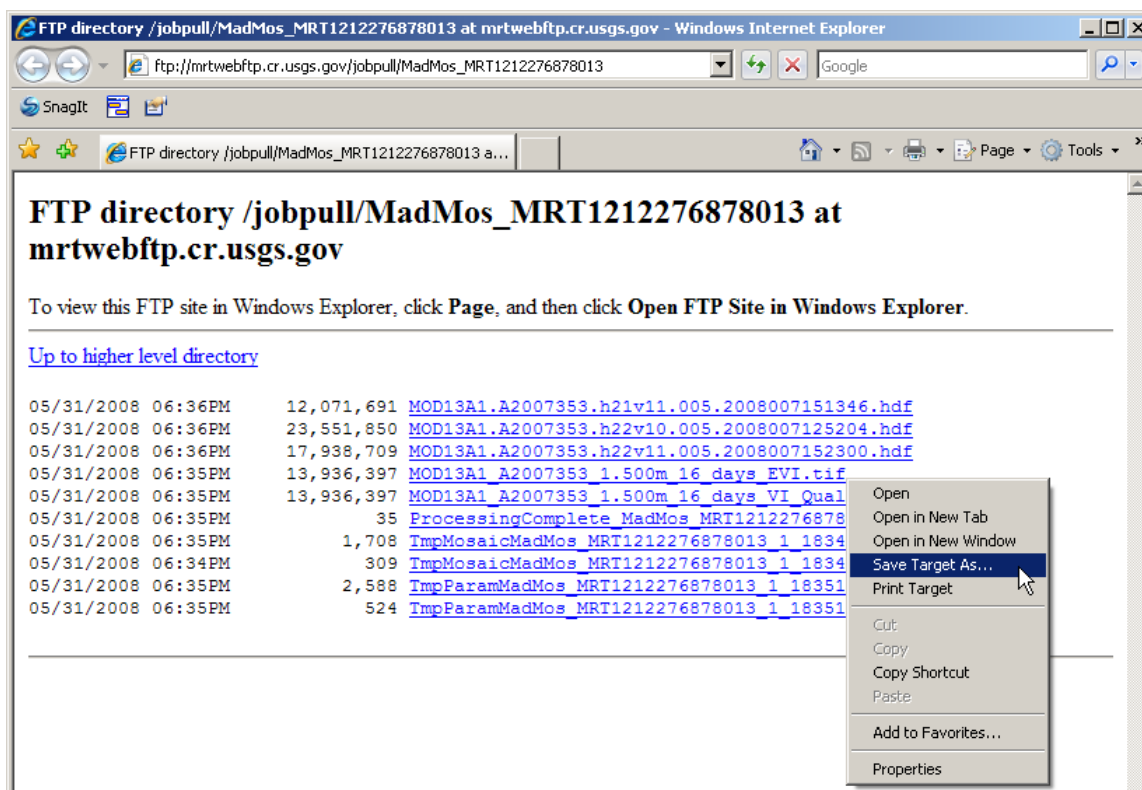
3.9 Set the processing options as follows (and shown above):

- Set the Processing Type to Reproject.
- Enter a name in the Job Name field (e.g., MadMos).
- Set the Spatial Subset Input Lat/Long
- Enter -11.5, 42 (Lat/Long) for the Upper Left and -26.5, 51 (Lat/Long) for the Lower Right spatial subset to define a 15 degree by 11 degree area of interest.
- Set the Resampling options to Nearest Neighbor and Native Pixel Size
- Leave output file type set to GEOTIFF.
- Click on the Process button to initiate the processing job on LP DAAC servers. Click the OK button on the job notification pop-up message to acknowledge that the processing job has been submitted.





3.10 Click on the Download Tab to change from the processing options screen to the job monitoring and download screen. The job status message will initially indicate that the tiles are moving from the Data Pool to the staging area. As soon as the tiles are staged and processing begins, the status bar will begin showing the progress of your job. When the job has completed, **click the Download button** to spawn an FTP directory viewer.



3.11 Download the individual .tif files from the FTP directory to a directory on your local file system. The standard HDF files used in your processing job are available as well, but you do not have to download them. The MRT 4.0 log and parameter files are also available for download. You can download these text files to capture a record of your processing job.

A grayscale image of *MOD13A1_A2007353_1.500m_16_days_EVI.tif* (an output EVI file from this use case) is shown in figure 4 below. The mosaic corresponds to the 15 by 11 degree extent specified and is reprojected to geographic.

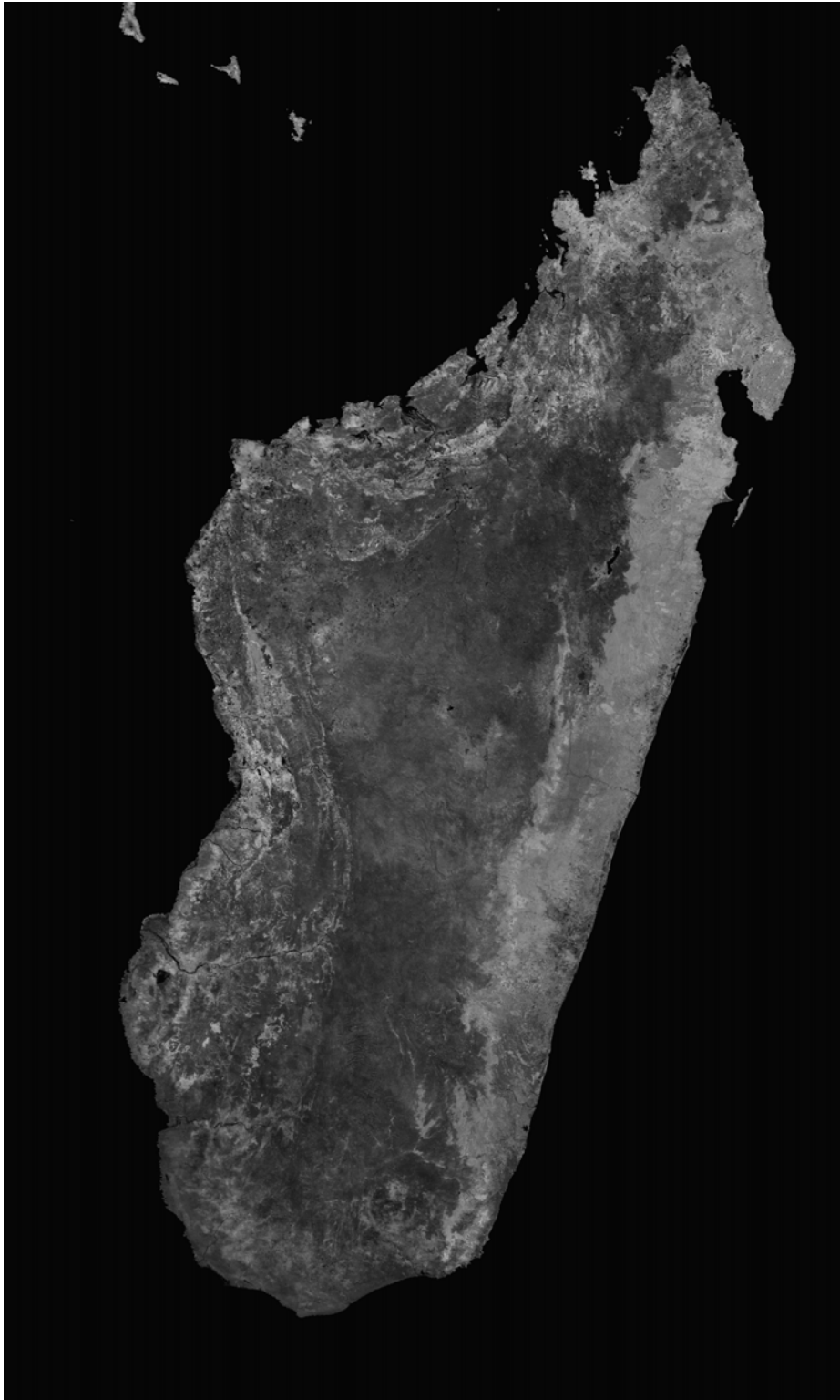


Figure 3. A grayscale image of *MOD13A1_A2007353_1.500m_16_days_EVI.tif*.

Further Guidelines for Beta Testers



Make sure pop-ups are not blocked by your browser before using MRTWeb.



Selecting very large numbers of tiles per processing job may slow processing performance and create very large output files for download. Users are encouraged to experiment with job sizes and provide feedback during the beta test. However, consider the following as initial guidelines for constraining your processing jobs:

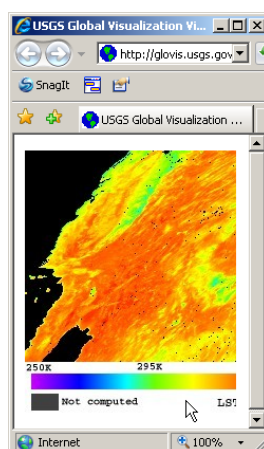
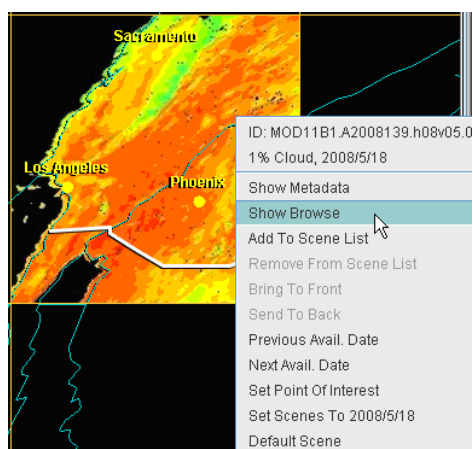
- Select up to a maximum of about 50 tiles for large area (i.e., continental) mosaicks
- For within-tile time series extraction, select up to a maximum of about:
 - Two months of daily data (~60 tiles)
 - One year of 8-day composite data (~50 tiles)
 - Two years of 16-day composite data (~50 tiles)
 - Four years of monthly data (~50 tiles)
- If outputting any large processing jobs in HDF format, select and process one band of interest at a time to avoid creating large multi-band files.



The scene list and layer selection check boxes are the main controls on what data sets are submitted for processing. Multiple tiles of the same date will be mosaicked automatically, so ensure that all the tiles are from the same date for mosaicking jobs. The layer selections will be universally applied to all tiles in the scene list.



Navigation and selection may be controlled in various ways using the interface. Experiment with different ways to navigate (e.g., using the locator map, dragging within the browse window, using the point of interest dialog box). Experiment with different ways to select (e.g., using the Add button, double-clicking on a tile of interest, using the Add All button for time series, using right-click options on the tile of interest).



Right-click drop-down options on the tile of interest include Show Browse, which gives the color scale for the product.



Geographic coordinates of the area of interest (i.e., the upper left and lower right corners of the desired Spatial Subset) can be estimated from MRTWeb. Place the cursor over the location of interest on the browse image and read the coordinate off the status bar at the bottom of the interface. It is best, however, to have your particular study area coordinates available beforehand.



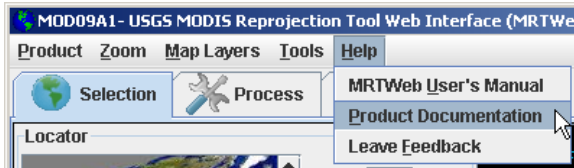
Users should fully understand their desired Projection Parameters before setting these options in MRTWeb. You may wish to enter your projection parameters to match pre-existing data sets for your study area.



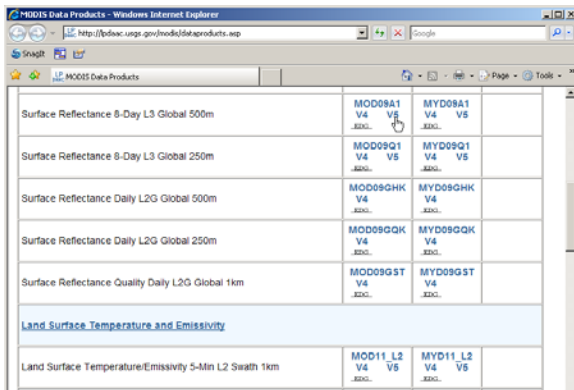
MRTWeb give the user a high degree of control over processing jobs. Inaccurate or nonsensical parameterizations of processing options may yield spurious results or cause submitted jobs to fail.



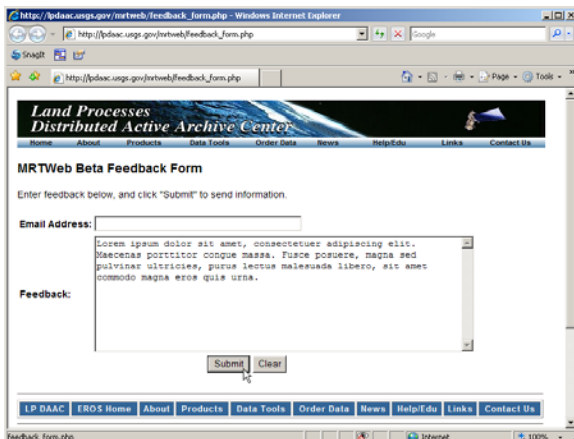
Correct use of the MRTWeb tool will produce results identical to the use of the stand-alone MRT 4.0 tool. The difference is that MRTWeb lets you act on HDF tiles remotely without downloading them first. You need only to download your processed files.



Use the Help drop-down menu to access the User Manual, Product Documentation, and the Feedback form.



Clicking the Product Documentation link opens a new window with the list of MODIS products described on the LP DAAC website. Make sure that you look at version 5 (V5) documentation only, since this is the only version available via MRTWeb.



Clicking the Leave Feedback link opens a new window with the MRTWeb Beta Feedback Form. Enter your email address, type your comments in the text field, and click submit to send us your feedback. You are welcome to give feedback as many or as few times as you wish. Please be as detailed as possible with your feedback to maximize the value of our assessment, further refinements, and quality of the public release of this capability. **Thank You!**