

## ACQUIRING AND IMPORTING MODIS DATA

These instructions describe how to acquire MODIS (MODerate resolution Imaging Spectrometer) data from NASA and how to import/view it using ERDAS IMAGINE and ArcGIS. There are two main sites for obtaining MODIS data: NASA's online database called WIST (Warehouse Inventory Search Tool) <https://wist.echo.nasa.gov/api/> and USGS's GloVis (Global Visualization Viewer) <http://glovis.usgs.gov/>. Additionally, the Land Processes Distributed Active Archive Center (LP DAAC) has a Data Pool where MODIS data can be searched or downloaded via FTP.

### MODIS Data

- To find information about MODIS data resolution, bands, and processing levels, refer to documentation at: [https://lpdaac.usgs.gov/lpdaac/products/modis\\_overview](https://lpdaac.usgs.gov/lpdaac/products/modis_overview).
- For guidance in selecting what data set you need and to find more specific information on each of the MODIS products, refer to: [https://lpdaac.usgs.gov/lpdaac/products/modis\\_products\\_table](https://lpdaac.usgs.gov/lpdaac/products/modis_products_table).
- To learn more about the type of data used in this exercise, read the information for MOD13A1 (Vegetation Indices 16-Day L3 Global 500m): [https://lpdaac.usgs.gov/lpdaac/products/modis\\_products\\_table/vegetation\\_indices/16\\_day\\_l3\\_global\\_500m/mod13a1](https://lpdaac.usgs.gov/lpdaac/products/modis_products_table/vegetation_indices/16_day_l3_global_500m/mod13a1)

### Method 1: Using WIST to Locate and Download MODIS Data Sets

Open the NASA WIST website at <https://wist.echo.nasa.gov/wist-bin/api/ims.cgi?mode=MAINSRCH&JS=1> and create an account. Sign in on the Login Form and then select the **Search** tab in the upper left of your web browser.

- In the **Choose Keywords for One or More Categories** box, make sure the **By Discipline** option is selected at the bottom of the box and pick a discipline/topic from the five available discipline choices (Atmosphere, Cryosphere, Land, Oceans, and Solar/Other). For this exercise, choose **Land: MODIS/Terra**. In the window above the discipline menu, scroll down the list of available MODIS products and find your desired data set. Here, we use *MODIS/Terra Vegetation Indices 16-Day L3 Global 1km SIN Grid V005*.
- In the **Choose a Data Search Type** box, make sure the **Primary Data Search** option is selected.
- In the **Choose Search Area** box, click and drag your cursor to rotate the Earth to your area of interest or enter the lat/long coordinates in the boxes on the right side of the page (zoom in as needed). Make sure the **Orthographic** option is selected.
- In the **Choose a Date/Time Range** box, make sure the **Standard Date Range** option is selected and enter your dates of interests in the proper format (or leave blank).
- Click the **Start Search** button.

A **Granule List** will be populated with all of the images that fall within your search parameters (i.e. area and dates of interest). Select your desired images. Click the **Add selections to cart** button in the top left corner. A **Data Quality Summary** appears; continue to the Shopping Cart. You will be asked to select your ordering options. Click the **Go to Step 2: Order Form** button to proceed. Verify **Your Contact Address** information. Scroll down toward the bottom of the page and click **Go to Step 3: Review Order Summary Before Submitting Order** or **Submit Order** (MODIS data is free of charge).

Your order will be delivered as a link within an email (takes anywhere from a few minutes up to 3 business days). When you receive the email, scroll toward the bottom and click on the link below the line that reads **Ftp Pull Download Links: OR** you can download the ZIP file version by clicking on the lower of the two links. Save the files and/or unzip them to your working directory.

## Method 2: Using GloVis to Locate and Download MODIS Data Sets

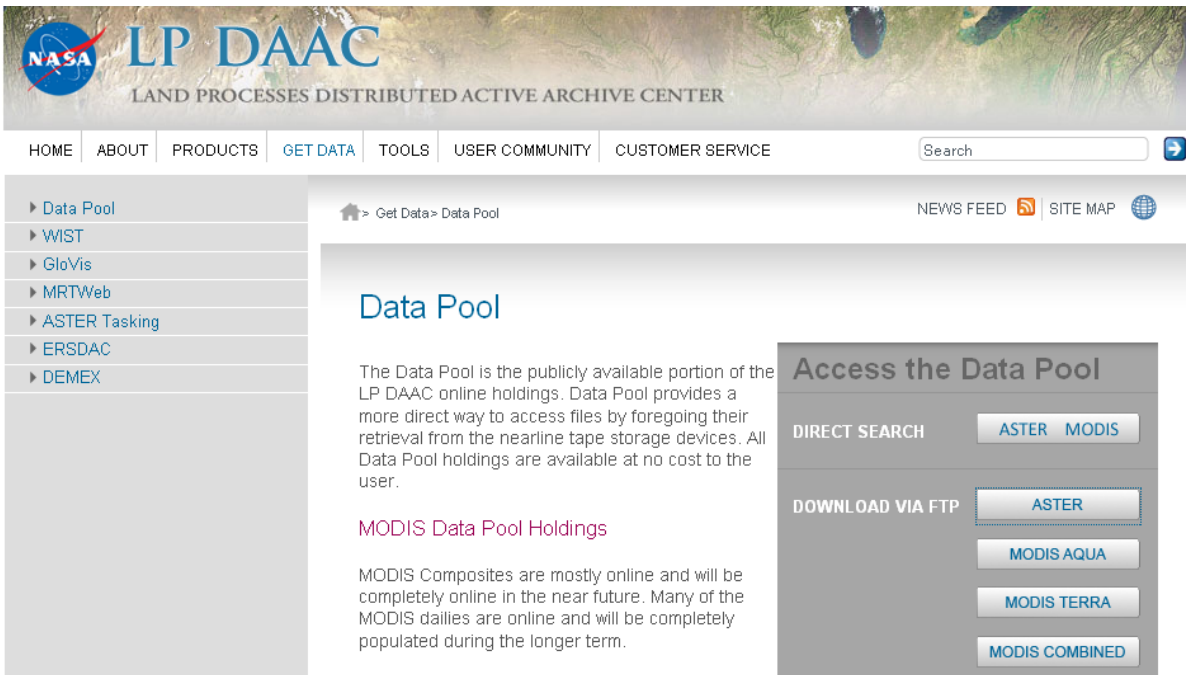
Open the USGS GloVis website at <http://glovis.usgs.gov/>. For this exercise, from the *Select Collection* drop-down choose **MODIS Terra** and from the adjacent drop-down select **MOD13Q1 NDVI** as the product. Then click on an area of the map (or type in the coordinates if you know them) to begin the data acquisition process.

A viewer will appear in a separate window (you must have your browser's pop-up blocker disabled). It will show the region you selected on the world map. Use the arrows to the left of the image to find the precise area you are looking for (you can type in the MODIS row/path or coordinates if you know them). To better orient yourself you can choose **Map Layers** from the menu at the top of the window and select to view Cities, Roads, or other layers overlaid on the image. Once you find your correct area, you can use the **Prev Scene** and **Next Scene** to find the particular year and month desired. You can also use the arrow buttons to move to the region adjacent to the highlighted area.

- When your desired area is highlighted and the correct year and month are selected, click **Add** in the lower left corner of the viewer (you may have to enlarge the window to see all buttons).
- When all of your desired scenes have been added to the Scene List, click **Order**.
- You will have to create a username and password (or sign in to your account) in order to download data.
- You will then be taken to the **Shopping Basket** screen. Click **Checkout** (the order is free) and review the **Order Summary**. Click **Continue** and review your contact information before clicking **Submit Order**. USGS will process the request and send a link to your e-mail address from which you can download the image(s).
- Follow the instructions in the email to save the images to your working directory.

### Method 3: Using the LP DAAC Data Pool to obtain MODIS Data Sets

Open the LP DAAC website at [https://lpdaac.usgs.gov/lpdaac/get\\_data/data\\_pool](https://lpdaac.usgs.gov/lpdaac/get_data/data_pool). Click **Direct Search** if you'd like to define the spatial and temporal filters to find data sets meeting your criteria; click on **Download Via FTP: MODIS** if you know the date of acquisition you are interested in (options include MODIS Aqua, MODIS Terra, or MODIS Combined).



To download MODIS data through **Direct Search**:

Click **Direct Search: MODIS** on the Data Pool site. Click on **MOLA** for the MODIS Aqua instrument data, **MOLT** for the MODIS Terra data, or **MOTA** for data combined from Terra and Aqua; then select the product level link in the Data Set column. There are several search parameters: spatial coverage (enter coordinates, or pan and zoom to use a rectangle or polygon to define spatial extent of your area of interest through a Java map) or date; day/night and data quality flags are also available.

To define spatial constraint options:

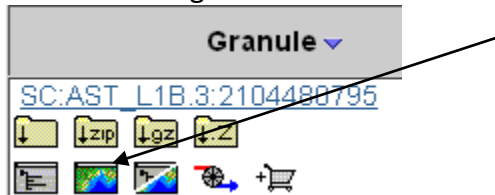
- 1) Pan and zoom to select an area of interest on the global map. Use the "Select Rectangle" feature to click and drag a rectangle over your area of interest or the "Select Polygon" feature to click points around your area. Once you have selected your area, click the "Add Selection to Search" button.  
or
- 2) Enter coordinates for a bounding rectangle for your desired area. Click the "Add Selection to Search" button once the coordinates are entered.

To select a date or date range, use the links to select day, week, month and year; or use the drop-down under "Select a Date Range" to choose a start date and end date. Click the "add it

to your search criteria” button. Next, you can select an upper limit to the amount of cloud coverage in the scenes returned in your search results.

The day/night flag can be D (day), N (night), or B (both). Select the desired day/night flag; some data sets may have a data quality flag named “Science QA” to filter parameter measurement quality; select a Science QA flag if necessary or choose “Get the granules”.

To browse images returned in the results, click on the browse icon below the granule ID:




In the Search Results, you can download granules individually or place multiple granules in a shopping cart to order at one time. In the shopping cart, you can change the format and projection of individual granules using the drop-down menus. When finished, click the “Select Media” button; click the “Download” option and then click OK. Enter your email and click the “Order the Data” button. Follow the download instructions in the email to save the data to your working directory.

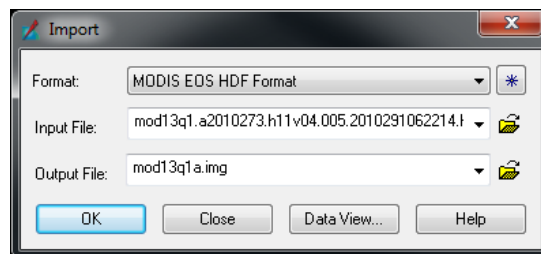
To download MODIS data through direct **FTP** access:

Click **Download via FTP**: MODIS (Aqua, Terra, or Combined) on the Data Pool site, then select the desired product.

The MODIS data folders are organized by acquisition date, each folder contains the HDF files, XML documents (metadata) and a JPEG browse images. Select your desired files for download, click the **Save** button on the File Download window to save to your working directory.

### Importing MODIS Data Sets into ERDAS IMAGINE 2010

MODIS images are downloaded as HDF files (.hdf) which IMAGINE can read. Open ERDAS IMAGINE 2010 and from the **Manage Data** tab, click on the **Import Data** button . Set the *Format*: to **MODIS EOS HDF Format**. For the *Input File*: navigate to your downloaded image; in the *Output File*: box navigate to the location you want to save the IMAGINE image file (.img file extension) and give it an appropriate file name. Click **OK**.



When the MODIS EOS HDF Format Importer window appears, click **OK** to execute the import file command. Click **OK** when the Job State is *Done*. (IMAGINE does not automatically open imported files – they will appear in the folder you indicated).


If you downloaded multiple images to cover your study area, repeat the **Import Data** steps for each image. Close the **Import** window when all images are imported.

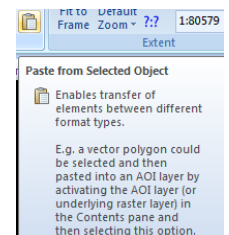
In IMAGINE, open your imported image(s) by right-clicking in **2D View #1 | Open Raster Layer** and fit to screen (from the **Home** tab, select **Fit to Frame**).

## Creating a Subset of MODIS Data in IMAGINE

To subset the image(s) to include only the land within your area of interest, go to the **Raster** tab | **Subset & Chip** | **Create Subset Image** and load your .img image as the **Input File**. Name the **Output File** after navigating to your desired output directory. Check the box **Ignore Zeros in Output Stats**.

There are three ways to define the subset area of your image:

- 1) **Inquire Box**: From the **Home** tab, select **Inquire Box** from the **Inquire Cursor** drop-down menu. This brings up a dialog where you can click and drag the box that appears on your image to cover the subset area (alternatively, you can enter x, y coordinates into the **Inquire Box** dialog; you can also change the color of the box to aid visibility). Click **Apply** when the box surrounds your desired area. Next, in the **Subset** window, click on **From Inquire Box...** then **OK** to run the process and wait while IMAGINE subsets the image.
- 2) **Area of Interest (AOI)**: Create a new AOI file and use it to clip the larger MODIS data file; this method is convenient if you already have a shapefile outlining your study area. Click on the  icon in the upper left corner and select **New | 2D View | AOI Layer..** and an “Aoi” layer appears in the **2D View #1** file list. After loading your shapefile in IMAGINE (right-click in the View | Open Vector Layer), right-click on your .shp layer and select **Display Attribute Table**. Select all of the rows (by highlighting them or going to the **Table** tab and clicking **Select All Rows**); the polygons in the View should change colors. Create an **AOI** of these vector polygons by clicking on the Aoi layer in the **2D View #1** list to select it, then going to the **Home** tab and clicking on the **Paste from Selected Object** icon in the **Edit** area. Now you need to select all of the AOI layer components by drawing a rectangle around them. On the **Home** tab, click **Select** and choose **Select by Box** from the drop-down. Draw the rectangle around the AOI components and notice that the area becomes selected. Next, in the **Subset** window click on **AOI... | Viewer | OK**, this will ensure that only the desired boundaries are used in the subset. Click **OK** to run the process and wait while IMAGINE subsets the image.



- 3) **Corner Coordinates:** If you know the map coordinates of the corners of your subset area, you can enter them directly into the **Subset** dialog. In the Subset Definition section, enter the x and y coordinates into the boxes then click **OK** to run the process and wait while IMAGINE subsets the image.


Open your subsetted image in a View to check that the image was clipped to your desired area.





### Reprojecting MODIS Data in IMAGINE

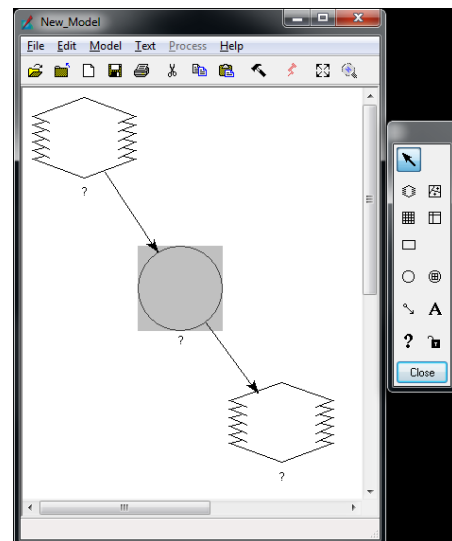
In IMAGINE, from the **Raster** tab, select **Reproject**. In the **Reproject Images** dialog, navigate to your subset image for the **Input File**. Navigate to your working directory and name your **Output File** image accordingly. In the **Categories** box, select your desired coordinate system from the drop-down. Select your **Projection** from the second drop-down and set your desired units (i.e. meters). Click the box next to *Force Square Pixels on Reprojection* and enter your desired pixel size in the *Output Cell Sizes:* field (i.e. 1000 m). Leave the rest of the default settings and press **OK** to run the reprojection.

Open your reprojected image in a View to check that the image was reprojected correctly. From the **Home** tab, select **Layer Info | View/Edit Image Metadata** to review the projection information for your new image.

### Rescaling MODIS Data in IMAGINE

In IMAGINE, from the **Toolbox** tab, select **Model Maker**. In the **New Model** window, click on the Display Tool Palette icon  and create a new model similar to the one shown here:



- Once your model structure is created, double-click on the top left raster object  and select your reprojected image. Leave the rest of the default options and click **OK**.
- Next, double-click on the function object . Select your reprojected layer from the *Available Inputs* field. Then multiply your image by the appropriate scale factor (i.e., \*0.001). Click **OK**.
- Now, double-click on the bottom raster object  and navigate to your working folder. Name your rescaled output image according to your naming convention. Leave the rest of the default settings and click **OK**.
- Once your model is set, click the red lightning bolt  in the **New Model** window to run your model.



Open your rescaled image in a View to verify that the model worked properly.

## Importing MODIS Data into ArcGIS

Images acquired from GloVis and WIST are downloaded as .hdf files, which ArcGIS can read.

- Start a new session of **ArcMap**.
- Click the **Add Data** button . You may first have to connect to your working folder in order to access its data. Select the **Connect to Folder** button  and navigate to your working folder that contains **MODIS data** by clicking the ▷ **symbols** to expand the folder tree. **Highlight** the folder where you plan to work (and which contains **MODIS data**) and click **OK**.
- Navigate to one of the .hdf files in your MODIS data and click **Add**. ArcMap will display a “Subdataset Selection” window which allows you to select one dataset to display as a single raster layer, or to select multiple datasets to display as a group layer or RGB layer. Make a selection to add some or all of your MODIS layers to the map.
- On the left side of your screen is the Table of Contents. The order in which the layers appear in the Table of Contents is the same as the order in which they appear in your map. If you click on a layer and drag and move it below another in the Table of Contents, it will also move below that layer in the map display. The check boxes next to the layers indicate which layers are active. If you uncheck one of the boxes, that layer will disappear from your map on the screen; you can re-check it to re-display it.
- Double-click on a layer name to bring up the “Layer Properties” dialog where you can change the Symbology of each layer to create the display format you desire.