Downloading, Layer stack and Subset Remote Sensing Imagery

Objectives
The aim of this practical is to familiarize you with:

- Access to Remote sensing data
- How to make layer stacking.
- How to make a subset for area

Task 1: Downloading Remote Sensing Imagery

1. Searching RS Imagery using Earth Explorer

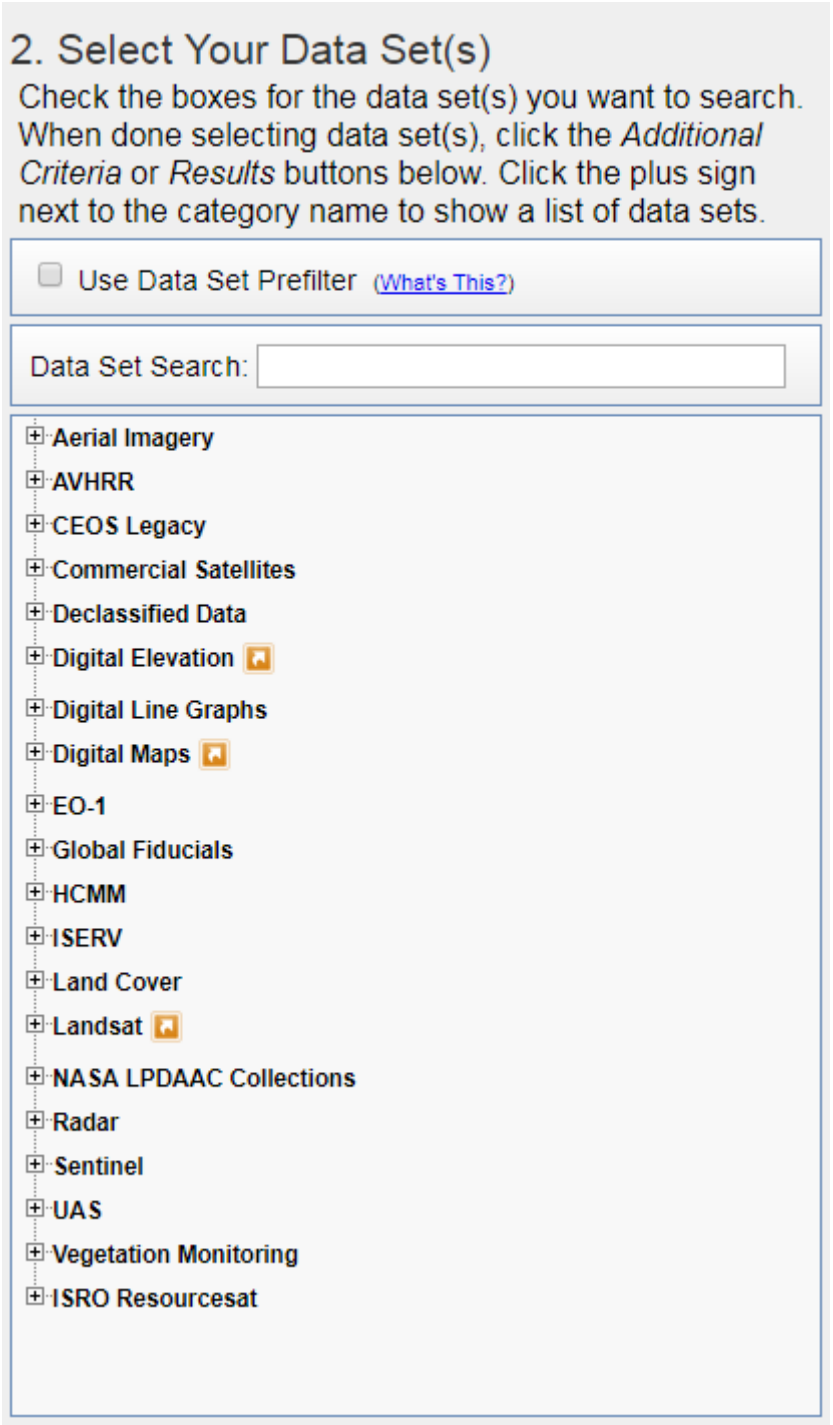
The U.S. Geological Survey (USGS) maintains the largest archive of Landsat imagery for the world. The USGS image search system is called EarthExplorer.

Open the EarthExplorer home page: https://earthexplorer.usgs.gov/

The next few screens are divided into frames where you enter the information for your image search. Each box has a title – in the instructions below, I start each step with the title of the frame I am referring to.

A. Data Set Selection page

Once the page loads, you can begin to identify the imagery you are looking for.



1. Click on the **+** next to **Landsat** to expand the list of datasets. Then click the + next to **Landsat Collection 1 Level-1**

2. Check:

   - **Landsat 4 and 5TM C1 Level-1**

B. Search Criteria (Spatial Coverage frame)

In the first frame - *Search Criteria* - you specify the region of interest. You can either search by using the map, entering co-ordinates or entering a place name. For this practical we will search using **Place Name**.

1. Enter *Southampton, UK* for **Placename and click search. (you can also select the area of interest by clicking on the Google map layer)**
2. Click on **Southampton, UK**
3. You will see the corresponding lat/long will appear on the **area selected** box.
4. Now you need to provide a date range to search for your data.
5. Enter **June 1, 2006** and **August 1, 2006**, for from and to date range respectively. (Remember this site accept MM/DD/YYYY format)
6. Then click **Research** on the right hand corner of the page.
7. While the system is searching the archive, the **Results Summary** page will be updated on your screen every 10 seconds. Wait until the *Status* indicates that the search from both data sets is *Complete*.

Buttons: Left to Right

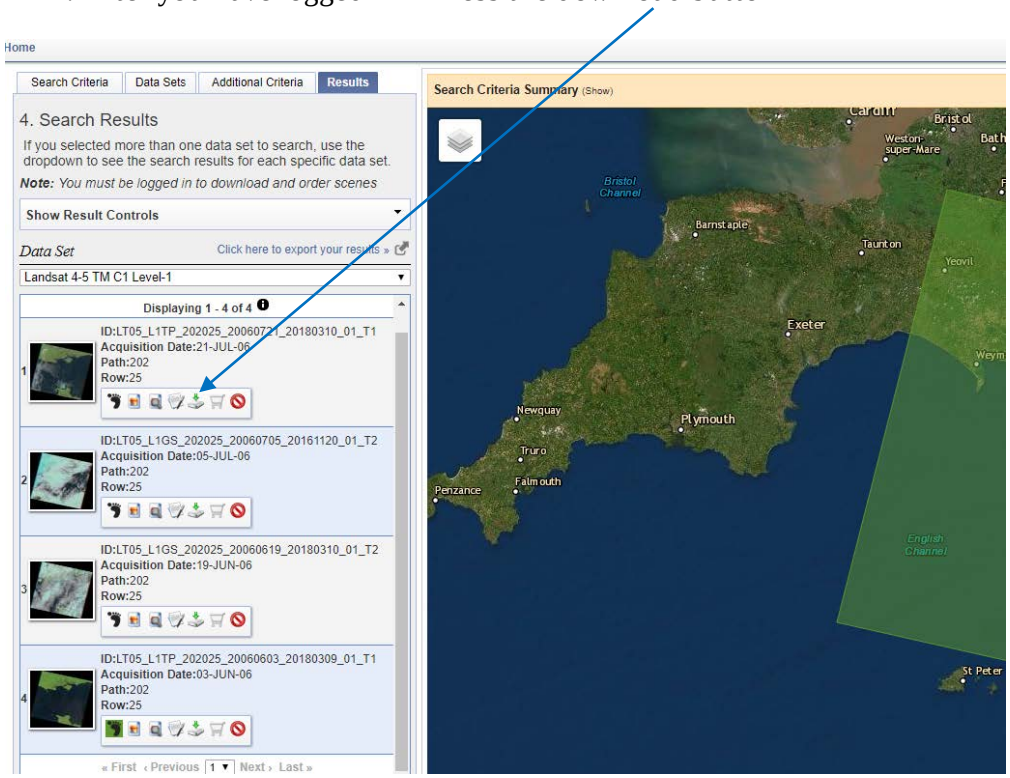
8. You are now presented with a list of images which match your search criteria. You can evaluate each dataset by examining its **Preview Image** and **Acquisition Date**. The objective is to find an image that clearly shows your region of interest.

9. Select the **03-Jun-06** image as it is cloud free

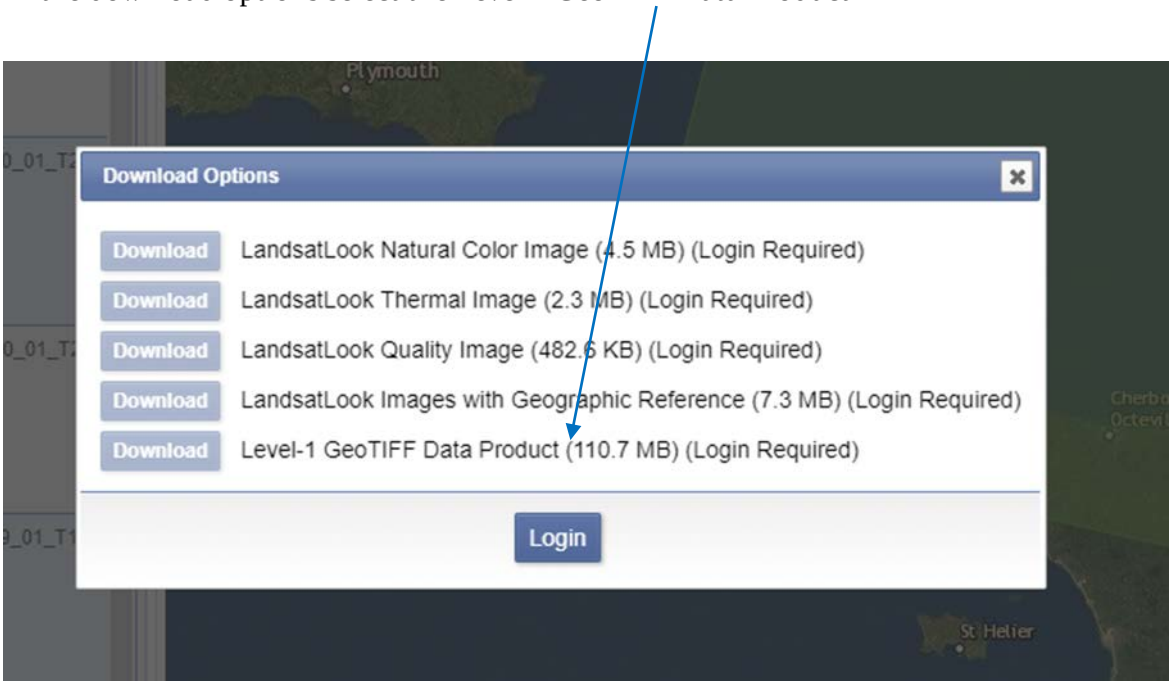
10. Overlay image 'footprint', overlay image, compare browse image, read image metadata, download image (need to be logged in),

11. *****IMPORTANT: In order to download the image you need to register and sign in to Earth Explorer**

12. After you have logged in – Press the download button



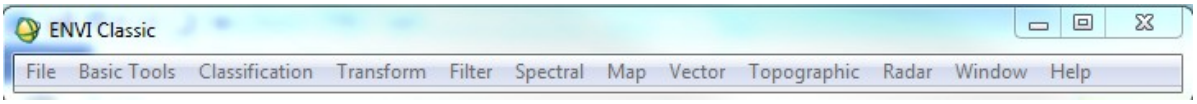
13. In the download options select the Level-1 GeoTIFF Data Product



14. ***Note:** The downloaded file will be a file that has been zipped twice. To use the data, you need to unzip it twice (preferably use 7-Zip for this).
15. After unzipping twice, the folder where you saved the data should contain all bands with the extension of **.TIF**

TASK2: Loading the unzipped files into ENVI

1. Start ENVI Classic Software



2. Select **File/ Open Image File**.

3. Navigate to the folder where you unzipped the files to.

4. Select all bands that you need (Often bands 1,2,3,4,5 and 7, omitting band 6 as it is a thermal band)

- LT05_L1TP_202025_20060603_20180309_01_T1_B1.TIF
- LT05_L1TP_202025_20060603_20180309_01_T1_B2.TIF
- LT05_L1TP_202025_20060603_20180309_01_T1_B3.TIF
- LT05_L1TP_202025_20060603_20180309_01_T1_B4.TIF
- LT05_L1TP_202025_20060603_20180309_01_T1_B5.TIF
- LT05_L1TP_202025_20060603_20180309_01_T1_B7.TIF

Task 3: Layer Stacking

Use **Layer Stacking** to build a new multiband file from georeferenced images of various pixel sizes, extents, and projections. The input bands will be resampled and re-projected to a common user-selected output projection and pixel size. The output file will have a geographic extent that either encompasses all of the input file extents or encompasses only the data extent where all of the files overlap.

1. Select one of the following options from the ENVI main menu bar:

    - **Basic Tools > Layer Stacking**
    - **Map > Layer Stacking**

    The **Layer Stacking** Parameters dialog appears.

2. Click **Import File**. The Input File dialog appears.

3. Select all the bands loaded in the previous section then clock OK.

4. Make sure the bands are in order that is, from 1, 2… to 7. If they are not click the **Reorder Files.** Then click on each band and hold down the mouse and drag and drop the bands in the right position

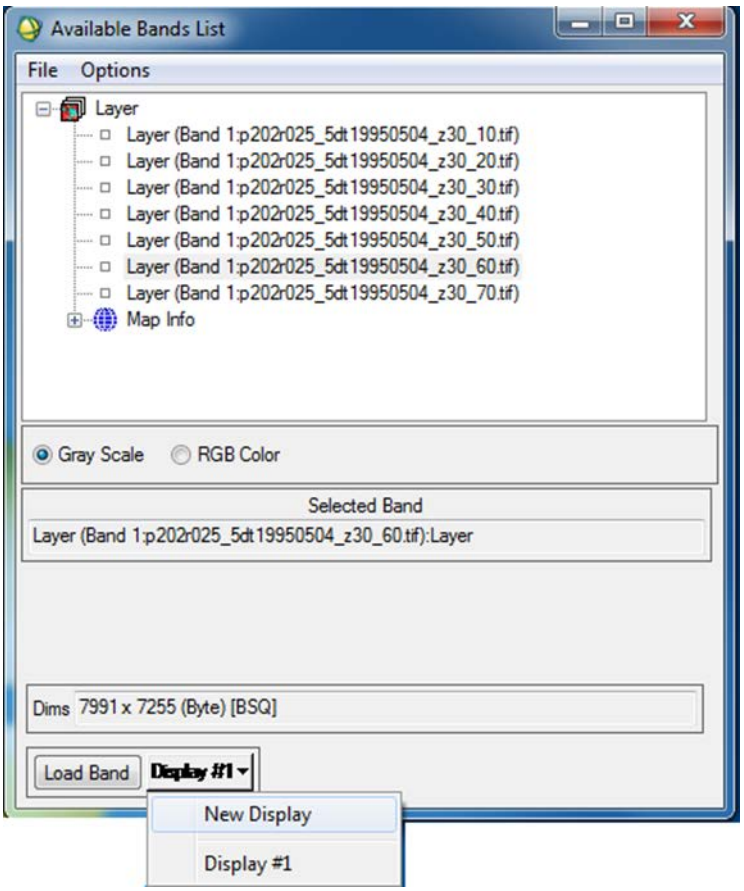
5. Then select all the files and then press **Choose** to name and save the layer stack file (Name it something like **Southampton_Layerstack_2006.tif**).

6. Click **OK**. ENVI adds the resulting output to the Available Bands List, i.e. **Southampton_Layerstack_2006.tif.**

7. You can then load the new layer stack image to view it.

Note: At this point you have the choice of loading either a grayscale or a RGB colour image

8. Click on the **Gray Scale** toggle button
9. Select **Band 4 (NIR)** in the dialog by clicking on the band name in the Available Bands List. The band you have chosen is displayed in the field marked **Selected Band**
10. Choose **Load Band** in the Available Bands List to load the image into a new display. Band 4 will be loaded as a gray scale image. The display now shows a NIR (Near Infrared). Note the grey contrast in the image. The grey palette ranges from black (colour ‘0) to white (colour ‘255’).



11. To load "**False colour" image**, **Select** RGB and then **Select** Band 4 as Red (R), Band 3 as Green (G) and Band 2 as Blue (B). In this display vegetation will appear red.
12. To Load **"True colour"** image, **Select** Band 3 as Red, Band 2 as Green and Band 1 as Blue.

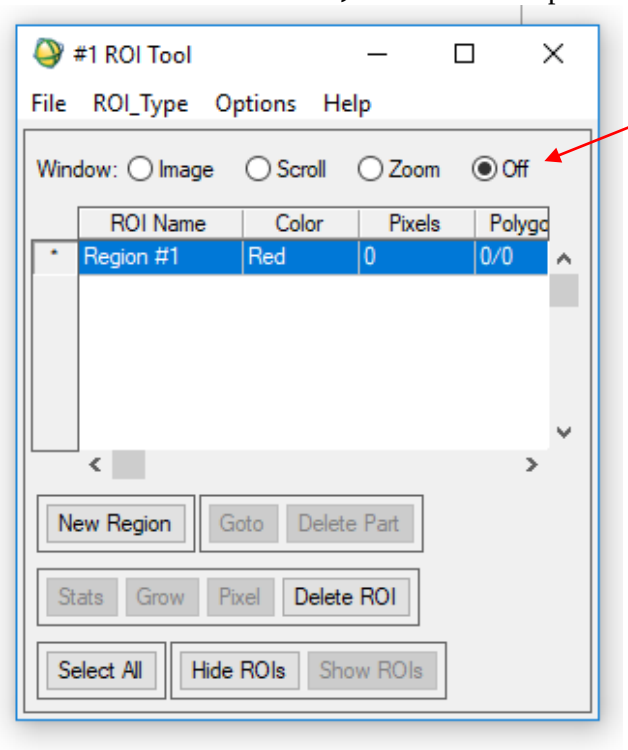
Task 4: Subsetting data via ROI

In order to work with an image sometimes you do not need to use the whole image. In that case you need to subset the image to reduce the extent. Use **Subset Data** via ROIs to **subset** city of Southampton from your image**.** To **subset** an image file based on the bounding box (that is, the area encompassing) an ROI or group of ROIs currently drawn on an image, follow these steps:

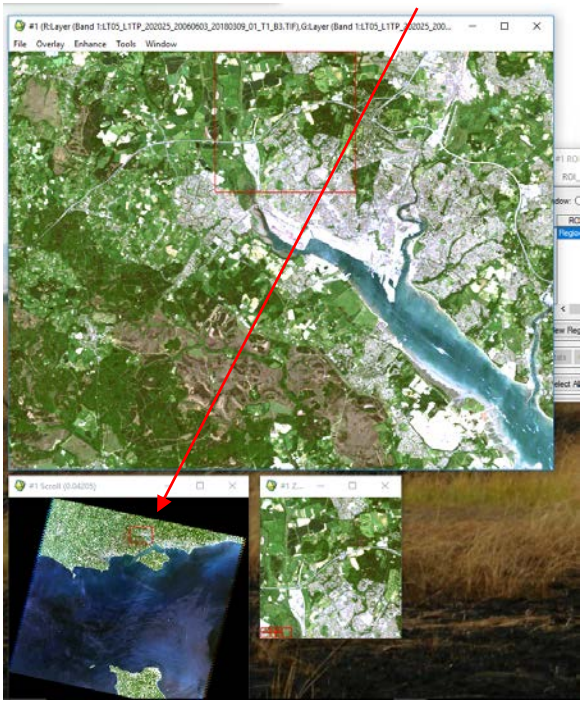
1. Select **File** / **Open Image File** on the ENVI main menu.

2. Navigate to your home directory and open the **Southampton_Layerstack_2006.tif**
3. The Available Bands List dialog appears on your screen.
4. Select the **RGB Colour** radio button in the Available Bands List
5. Click on bands 3, 2, and 1 sequentially with the left mouse button.
6. From the Display group menu bar, select **Overlay > Region of Interest**

7. In the **ROI tool,** in the window pane first select the off radio button.



8. Then in the **Scroll window** zoom to the area where you would like to subset.



9. In the ROI tool > Change the ROI_Type to Rectangle. You can also use Polygon if you wish.
10. Then in the Window >Select the Image radio button
11. Then press down the left part of the mouse and draw a rectangle on your area of interest. To finish creating the region of interest right click the mouse. This will create a rectangular region of interest
12. After creating this ROI, you are ready to subset the image to this ROI.
13. From the ROI Tool dialog menu bar, select **File > Subset Data via ROIs**. The Input File dialog appears.
14. Select the file (**Southampton_Layerstack_2006.tif**) to **subset** and Click OK.

15. The Spatial **Subset** via ROI Parameters dialog appears.

16. Select the input ROIs.

17. In the **Mask pixels outside of ROI,** toggle button to select **Yes**, and enter a background value as 0 (Zero).

18. Select output to **File** and Then Choose to name and save the file. You can name it as **Southmapton_City_Subset.tif**

19. Click **OK**. ENVI adds the resulting output to the Available Bands List.

20. You can work with the subset image in your classification exercises/assignment.