Step 1: Identify the site and download the sentinel data. There are different ways to download the data, suit yourself.

1. Through sentinel API
2. Using the “Copernicus DataSpace”
3. Pystac

Step 2: Unzip the data; however it is important to note that, if you use SNAP or any other sentinel toolbox to analyze the data make sure you keep the default file name with the respective file extension.

Example: For Sentinel 3: “S3A\_SL\_2\_LST\_\_\_\_20231031T165315\_20231031T165615\_20231031T174845\_0180\_105\_112\_0360\_PS1\_O\_NR\_004.SEN3”

Step 3 (a): The sentinel-3 files usually come in the netcdf format and it is usually easy to process and export them to them using the SNAP toolbox (native to sentinel data).

Step 3 (b): Download SNAP if you do not have it. Link: <https://step.esa.int/main/download/snap-download/>

Step 4: Since SNAP is native to sentinel products, you only need to load the XML file of the downloaded product and it will show you all the products (bands, masks and whatnot).

A screenshot of a computer

Description automatically generated

Figure 1. Open Product and load the .xml file

Step 5: Load the band(s) of your choice. LST in our case.

Step 6: Usually, it is essential to reproject the band to a desirable projection. Hence, we use the reprojection tool to reproject the layer.

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Figure 2. Reprojection Tool

Step 7: After reprojecting, the layer is ready to be exported as .tiff file. You can export it and use it for further analysis.

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Figure 3. Export product step. Choose the subset you want from the list, save the file name and export

**1000m to 10m**

**Reference:** <https://towardsdatascience.com/downscaling-a-satellite-thermal-image-from-1000-m-to-10-m-python-3b2ed19ff103>

**Step1:**

Load the sentinel-2 band and check the CRS, reproject the sentinel-3 according to s-2 band crs.

**Step 2:**

Clip the reprojected sentinel-3 image to the bounds of the sentinel-2 image or the NDVI image.

* It might be memory and computation expensive. As an alternative, you can use a GIS software to clip the image and load it in python for smoother processing.

**Step 3:**

After clipping the LST band, you can polygonize the band and store the NDVI values in the same shapfile.

* Fill the NA values with the mean estimate using the zonal statistic tool.

**Step 4:**

Since the whole upscaling is based on the correlation concept, we will try and find the slope and intercept.

**Step 5:**

Use the correlation equation with NDVI to produce a sharp LST band image – rescaling it to 10m.

**Step 6:** write it as a raster tiff file and use it for visualization or any other use.