Assessment-1
Using arcpy for advanced map algebra applications

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Objectives

Enlist the objectives in relation to the tasks given in the assignment guidelines (less than 500 words).

Task 1: Automation of Downloading process for Aqua and Terra dataset (HDF files) from Earth Data of desired location.

Task 2: Extraction of .tif files from .hdf files of desired sub data index and implication of scale factor (to covert data into desired units).

Task 3: Mean of Daily daytime and night-time spritely for Aqua and Terra could be used to compare the observations of both satellites.

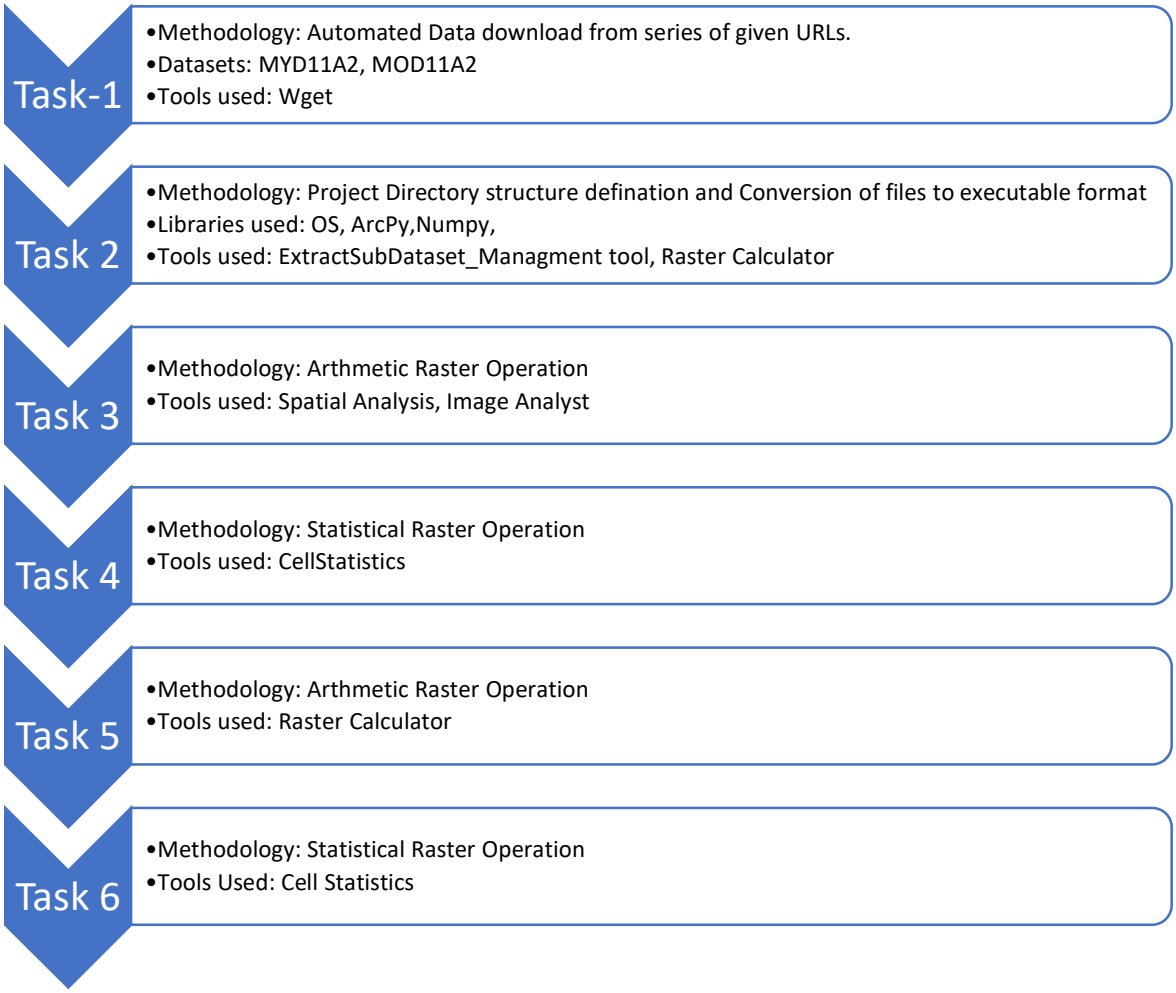
Task 4: Daily Land surface temperature using all four layers could be used in temperature related analysis as considering all four layers can minimise the error and result in more efficient analysis.

Task 5: Raster Calculation task gave an idea that raster is an Array/ Matrix and arithmetic operators can be performed over it.

Task 6: Application of different statistics using cell statistics gave insight on possible statistical extend that could be performed on the raster layers.

Task 7: Creation of python script with all task will help in automation of all tasks and easily implication of same program on multiple area while commenting within script helps in better understanding of all the attributes and flow of program later on by primary user or some other user.

Methodology



Task 1:

A text file/ script was downloaded from Earth Data, that contained URLs of HDF files related to Region of interest and given time period. Wget tool automated the downloading process.

Task 2:

ExtractSubDataset_Managment tool provided in Arcpy library was used to extract .tif file from downloaded .hdf files. During extraction, Subdata Index was included as 0,4 for Daytime and nigh-time temperature respectively.

Task 3:

Raster calculator provided in Arcpy library was used to calculate the desired mean.

Task 4:

CellStatistics tool was used to calculate daily daytime mean. As the size of dataset was large, direct arithmetic operation using raster calculator increases the processing time.

Task 5:

Raster Calculation was used to convert all temperature values to Celsius by simple subtraction arithmetic operation.

Temperature in Celsius= Temperature in Kelvin – 273.15

Task 6:
Different Statistics operations were implemented using Cell Statistics.
Operations Performed:

1. Maximum: Raster Representing highest temperature in Region of interest(ROI) during time period January 2018 to December 2020
2. Minimum: Raster Representing Lowest temperature in ROI during time period January 2018 to December 2020
3. Range: Range Raster Represent the temperature variation in ROI during time period January 2018 to December 2020
4. Majority: Majority temperature Raster gives a rough idea about the most occurring temperature in the region.
5. Minority: Majority temperature Raster gives a rough idea about the least occurring (but still present) temperature in the region.

Task 7
Program was converted from .ipynb to py using 'ipython nbconvert --to script program.ipynb' command.

Results

Implementation of Range:
Range Raster Represent the temperature variation in ROI during time period January 2018 to December 2020

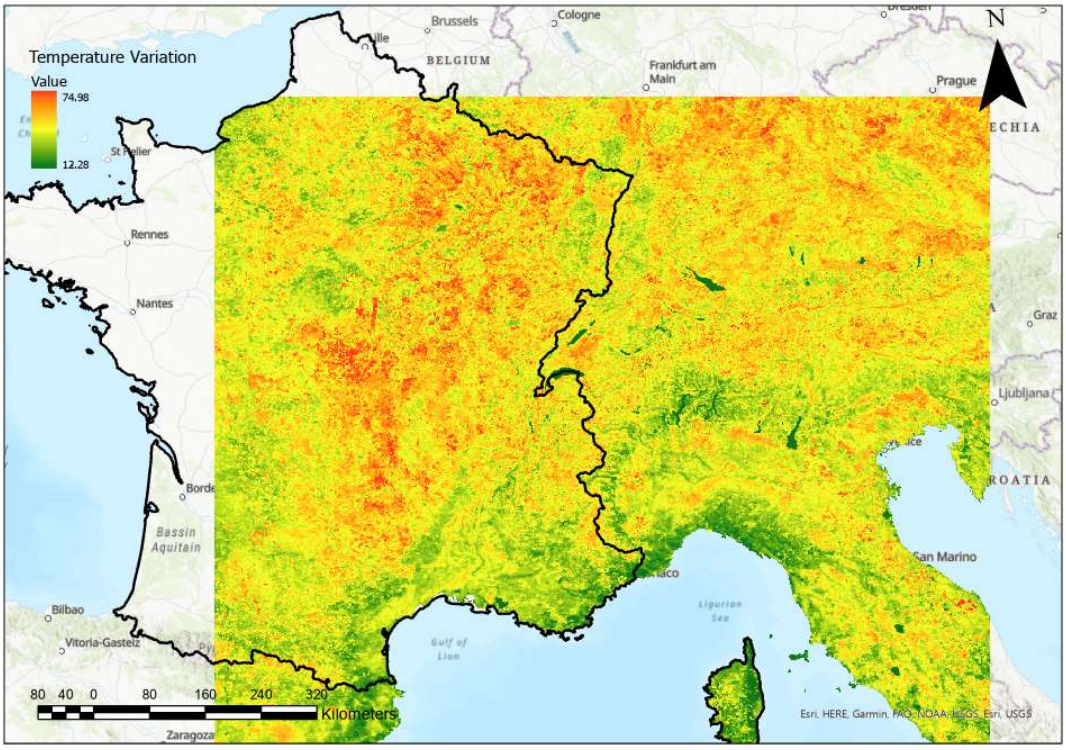


Figure 1 Temperature Variation Raster

Majority Statistic Operation:
Majority temperature Raster gives a rough idea about the most occurring temperature in the region.

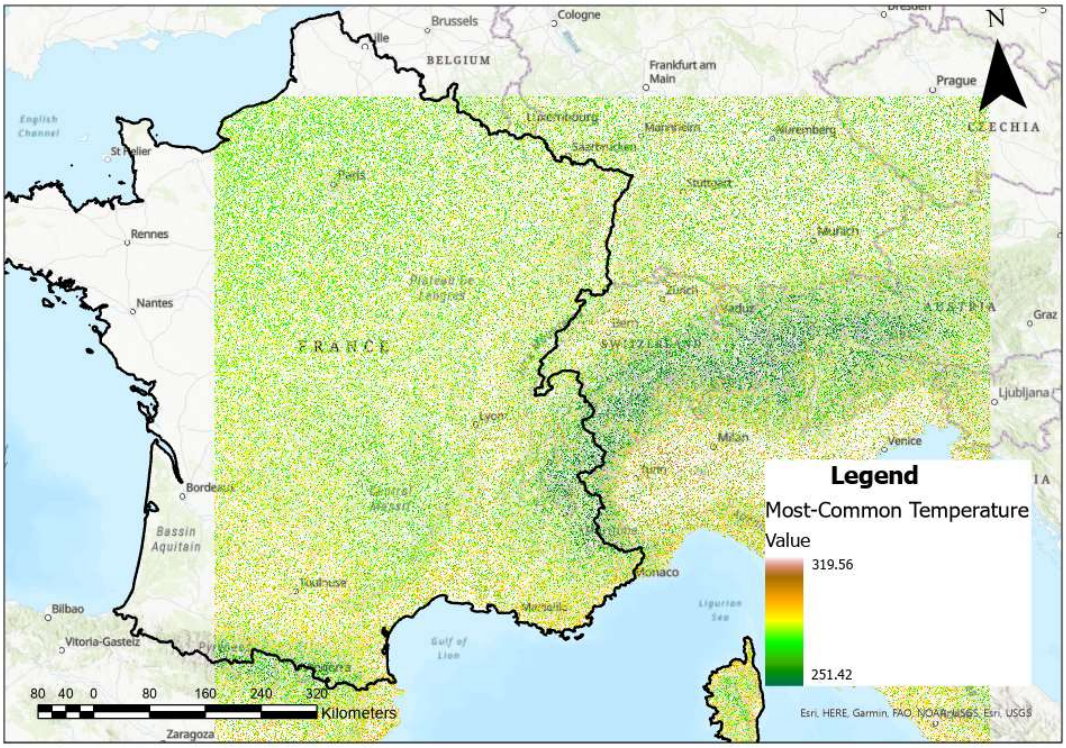


Figure 2 Majority Temperature Raster

Minimum Statistic Operation:
Raster Representing Lowest temperature in ROI during time period January 2018 to December 2020

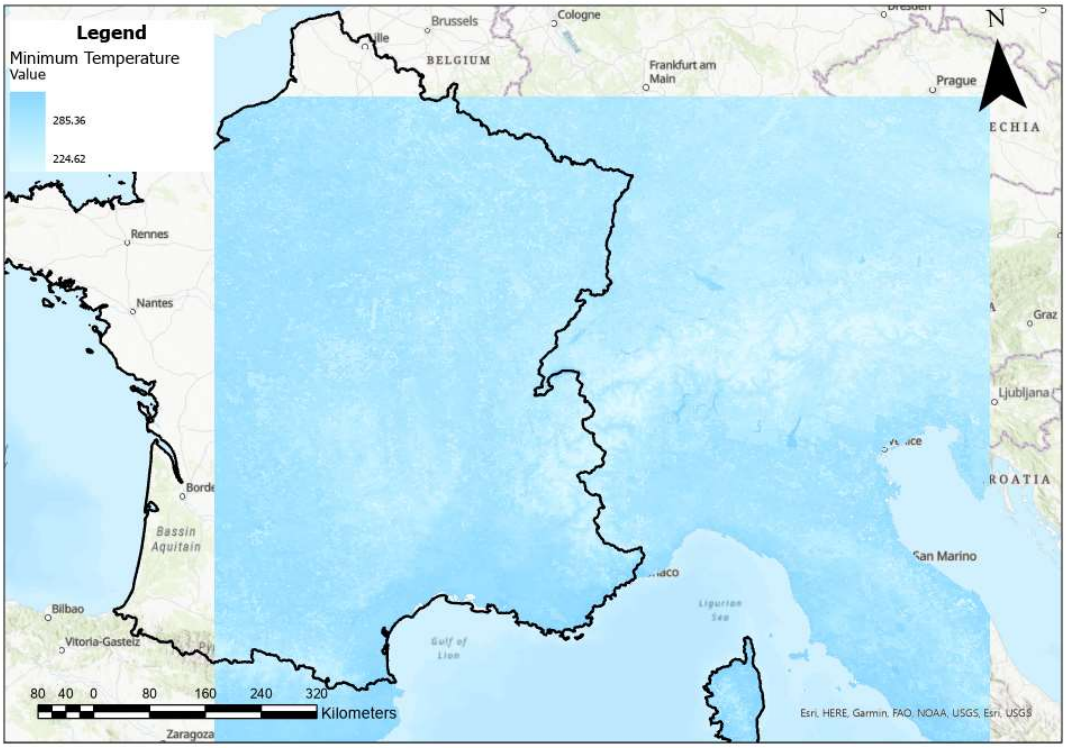


Figure 3 Lowest Temperature Raster

Maximum Statistic Operation:
Raster Representing highest temperature in Region of interest(ROI) during time period January 2018 to December 2020

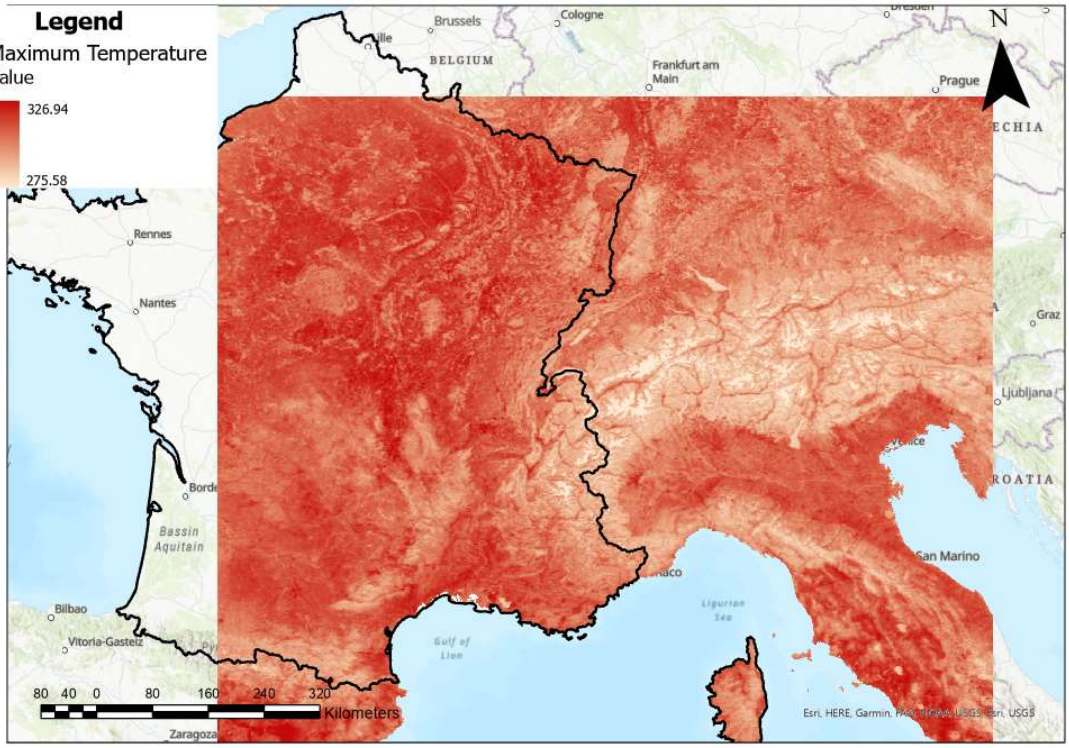


Figure 4 Highest Temperature Raster

Perspective

1. Major Isssues faced: Path interpretation difference by different libraries: Libraries used were os, arcpy, shutil. Due to the non homogeneous requirement of path specification requirement, path editing was required at many intincts.
2. Change in working directory: For os and arcpy library, current working directory plays and important roll and lead to errors if function doesn't include required address.