# Multihazard Training Outline

In this document the three step process to deliver the multihazard training is described.

This training focuses on four hazards:

- Wind
- Hail
- Drought
- Flooding

There are three basic steps: PreProcessing, AAHS Calculation and AAHS Metrics:



## Data PreProcessing

Available data for Wind, Hail and Drought is ready to be plugged to the Python scripts described in the Github repository.

However, Flooding data requires a bit of pre-processing.

### Flood File Clipping

The files provided of flooding depth are not referenced to a unique point. Quite the contrary, the origin of the surface described usually varies from one return period file to the other.

In the AAHS and Metrics scripts, we perform the calculation by the i,j indices, not by coordinates. This means that all input flooding files have to have exactly the same origin on the upper left corner and also the same size.

Checking original flooding files we see that:

```
% gdalinfo FinalDepth2y.tif
Driver: GTiff/GeoTIFF
Files: FinalDepth2y.tif
       FinalDepth2y.tif.aux.xml
Size is 35840, 16513
```

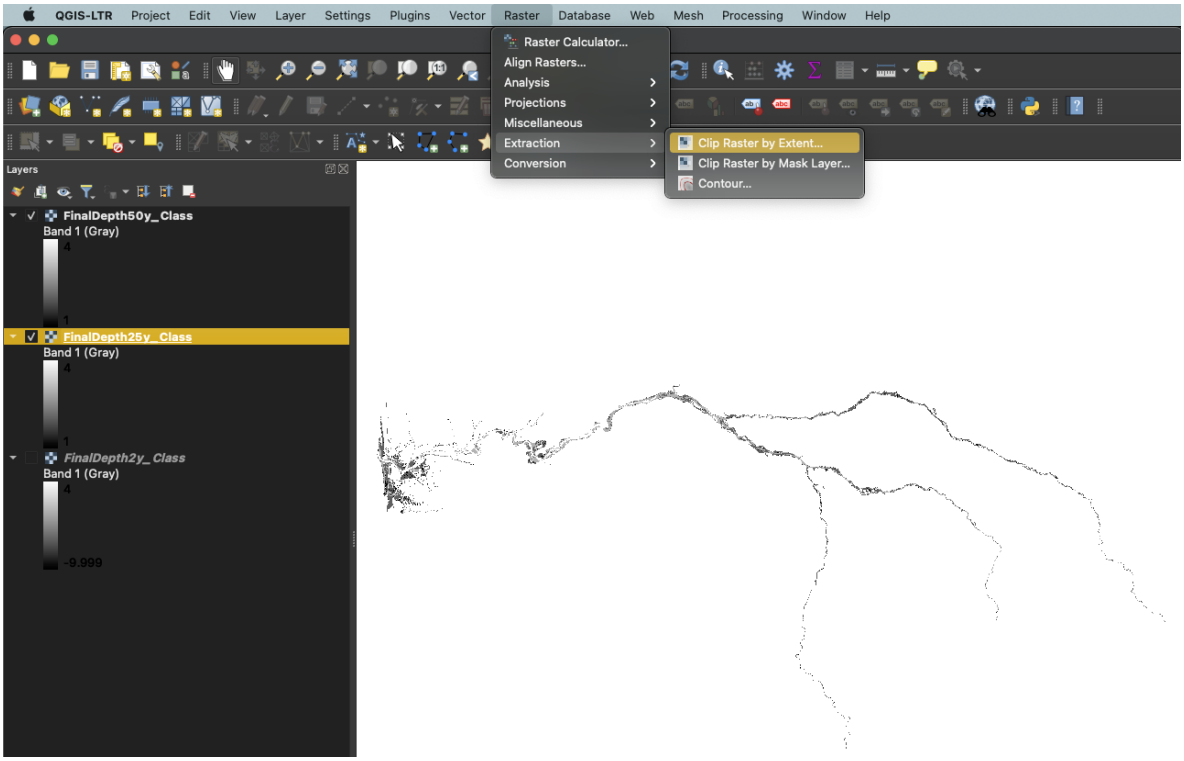
```
% gdalinfo FinalDepth25y.tif
Driver: GTiff/GeoTIFF
Files: FinalDepth25y.tif
       FinalDepth25y.tif.aux.xml
Size is 35859, 16532
```

To this end, we perform some clipping of the flooding files based on the 2-year return period file. This allows us to create the exceedance probability curve on the same data points without undesired shifts due to the different centered files.

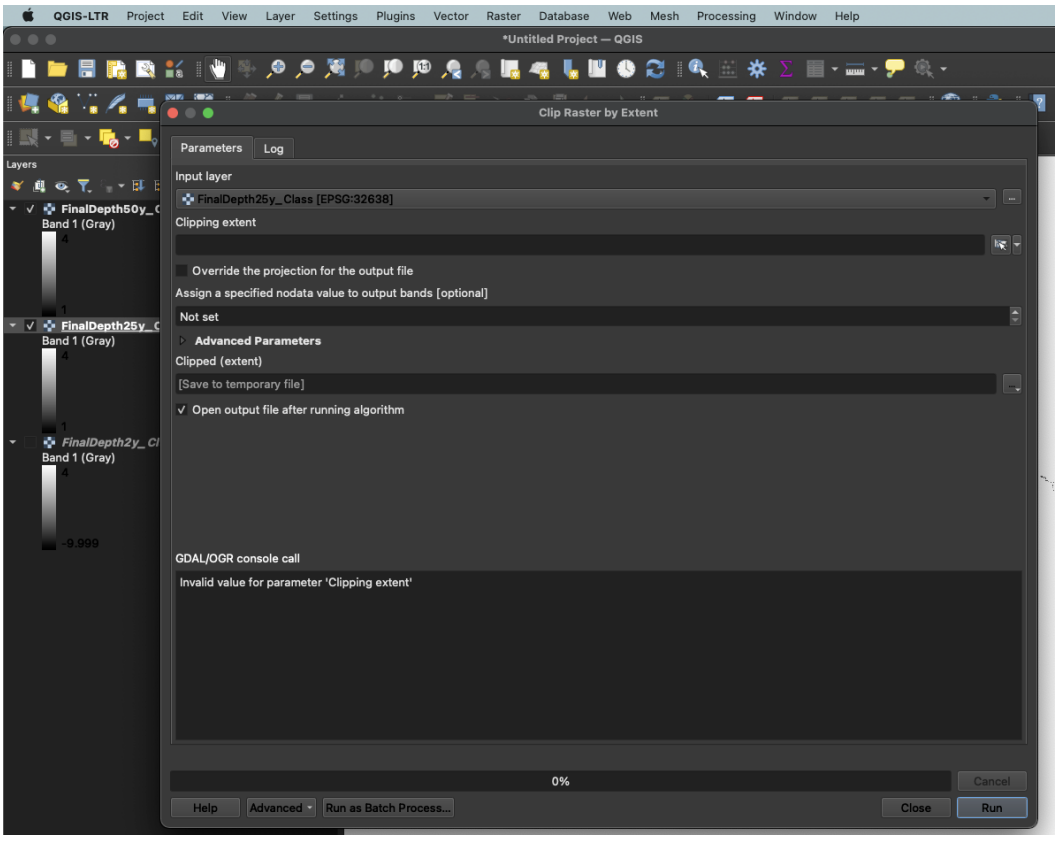
We first open some example files in QGIS under MacOS X. The example files are flooding depths in the Natanebi river basin for different return periods.

The idea is to clip all files using the same layer, in this case the 2-year return period file as we expect the largest extension in this file.

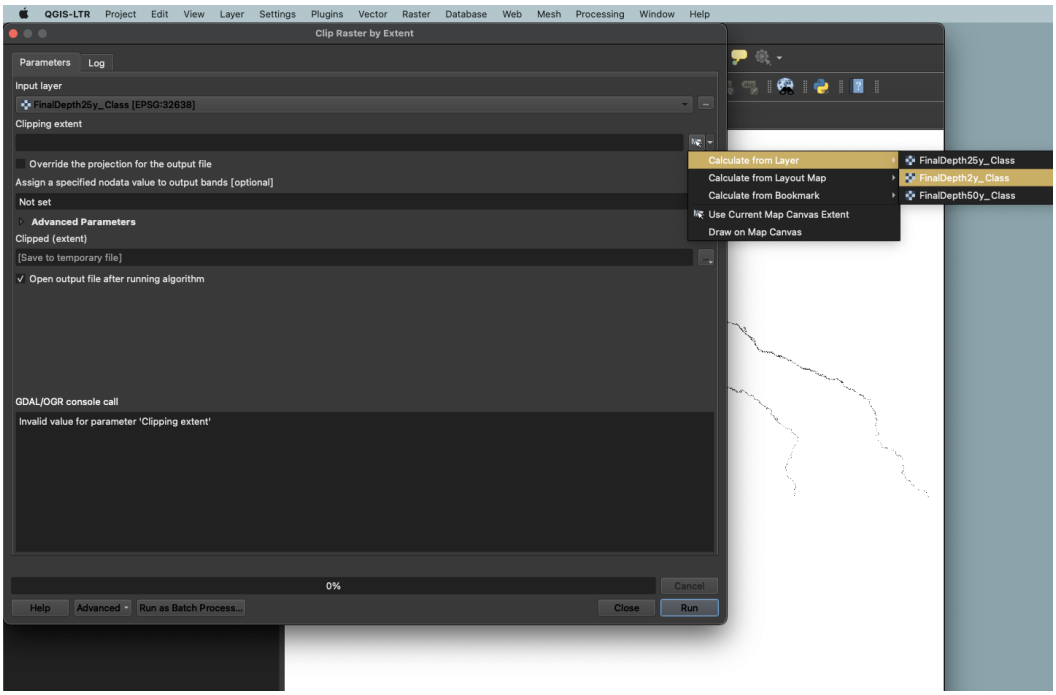
We select any other file and we go to Raster / Extraction / Clip raster by extent /




Then we have the box dialog about how do we want to perform the clipping:



And we select the clipping extent from a layer as follows:




## Resizing the clipped output

In the multihazard methodology the hazard model output is merged with other outputs from hail, wind and drought.

Despite the high resolution of the flooding model output, we usually perform a resize of the file as follows:

```
gdalwarp -ts 2500 yyyy Input.tif Output.tif
```

Setting an x-dimension size of 2500 pixels, leaving the y-dimension size proportional to that scale.

This optimizes the calculation time and further analysis of the different hazards.

## Classify the depth into intensities

Once we have all the input files with the same origin, we can perform the classification of the depths into intensity levels. For this, we use the script contained in Github called Classify_Flooding.py:

https://github.com/Datavizcowboy/Multihazard

To execute, the syntax is as follows for each return period:

```
python3 classify_flooding.py ./Natanebi/500year 500
```

For each input like:

```
FinalDepth2y.tif
```

We get an output file with the _Class at the end:

```
FinalDepth2y_Class.tif
```

## Annual Averaged Hazard Score Calculation

The AAHS calculation for all the hazards considered is summarized in these notebooks:

https://github.com/Datavizcowboy/Multihazard

## AAHS Metrics

The basic AAHS metrics calculation is resumed in the AAHS_Metrics python script in this repository:

https://github.com/Datavizcowboy/Multihazard