UNIVERSITY OF WEST ATTICA
SCHOOL OF ENGINEERING
Department of Surveying & Geoinformatics Engineering

OCEANOGRAPHY AND HYDROGRAPHY

ACADEMICYEAR 2022-2023

SEMESTER PROJECT

1. ANALYSIS OF HYDROGRAPHIC MEASUREMENTS

Around the port of Katakolo in the West Peloponnese (Greece)

https://www.google.fr/maps/place/37%C2%B038'38.7%22N+21%C2%B019'25.1%22E/@37.6440772,21.321441,17z/data=!3m1!4b1!4m5!3m4!1s0x0:0x96da6bbc73c84536!8m2!3d37.644073!4d21.323635

in August 2022, hydrographic measurements were carried out, with a multi-beam sonar, which are given in the archive

C:\limani katakolo

of the computer located in the PhD students room of Dr Emmanouil Oikonomou on the 1st floor, and where you can have access:

- By physical visit
- By connecting via ***Team Viewer*** (software that you can install https://www.teamviewer.com/en/download/windows/), after sending an e-mail to doctoral students:
    - PANAGIOTIS GOURDOMICHALIS gourdomichalis@hotmail.com
    - VISHNUVARDHAN REDDY YARAGUNDA vreddyyaragunda@uniwa.gr

to provide you with the computer password via Team Viewer.

The hydrographic data should be analyzed and corrected with the BeamworX software, the latest version of which is available on that computer, Additional practice examples can be downloaded from the link below

Click here to view Public Downloads
Password: "bwxreleases".

Due to the fact that only a single license of this software is available, please submit to the course calendar

https://eclass.uniwa.gr/modules/agenda/?course=GEO210

the hours that you will work at the computer, at least one day before, so that there is availability for other students.

As a final result of part (1) you need to correct, analyse and present in the BeamworX software the three-dimensional data of the hydrographic survey and to write a relevant technical report.

2. HISTORY OF COASTLINE

Based on the historical (ortho) photo maps of 1945, 2007-2009 and 2015-2016 from the website of the National Cadastre

http://gis.ktimanet.gr/wms/ktbasemap/default.aspx

we can make a survey of the coastline and assess any displacement (e.g. in regular transverse sections along the coastline) in a period between 1945-2016 between the port of Katakolo

https://www.google.fr/maps/place/37%C2%B038'38.7%22N+21%C2%B019'25.1%22E/@37.6440772,21.321441,17z/data=!3m1!4b1!4m5!3m4!1s0x0:0x96da6bbc73c84536!8m2!3d37.644073!4d21.323635

and the port of Kyparissia

https://www.google.gr/maps/place/37%C2%B015'21.8%22N+21%C2%B039'52.4%22E/@37.2560552,21.6623593,611m/data=!3m2!1e3!4b1!4m14!1m7!3m6!1s0x136102cd91712287:0x9c7635f2ecf5e2e2!2zzprPhc-AzrHPgc65z4PPg86vzrE!3b1!8m2!3d37.2512312!4d21.6694441!3m5!1s0x0:0x7e2c60f984c452b3!7e2!8m2!3d37.2560514!4d21.6645478?hl=el

It should be noted that the projection coordinate system of the National Cadastre is EGSA87. Examine whether the orthophoto map of 1945 has errors compared to the orthophoto map of 2007-2009 in the port of Katakolo.

3. SATELLITE BATHYMETRY

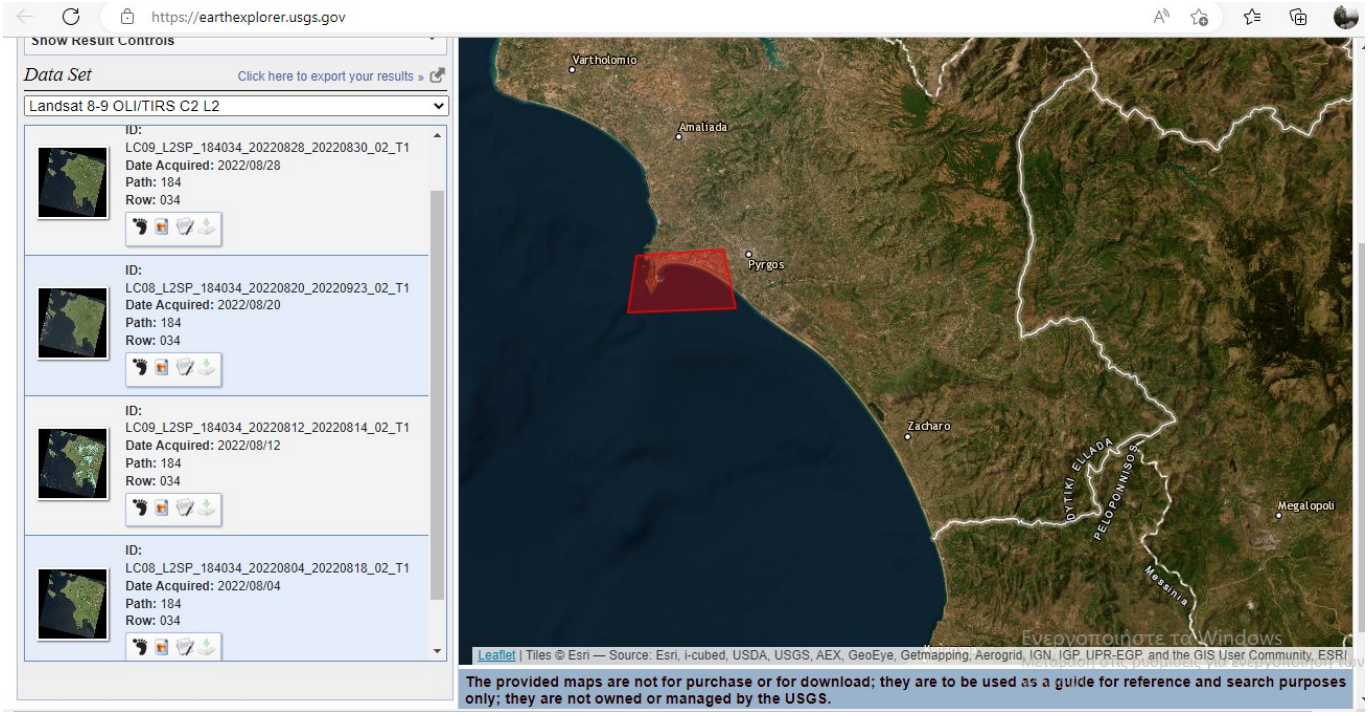
Go to [webpage https://earthexplorer.usgs.gov/](https://earthexplorer.usgs.gov/)

Initially register as a user from the Register option (top right) where you will need to provide a username, email and specify the password you want. In your email you will receive a message to confirm your registration

You enter with the username and password you have chosen by clicking Login.

Select Data Sets in the top left. Then select Landsat Collection 2 Level-2 and check the box of Landsat 8 OLI/TIRS C 2 Level-2. Select Search Criteria in the top left

With the cursor of the screen you can locate four points that surround the port of Katakolo. Any wrong point is corrected by dragging it by pressing your left mouse button continuously until it comes to the new location. Select Date Range on the left where you put date from August 1 to 31 2022. To view the Landsat 8 images based on the criteria you set, you will be shown the list of available images from which you will select the one that has not at all or reduced cloud cover in the study area. You will notice that there are 3 images of August 2022 that do not have cloud cover over the study area and you can choose whichever of the 3 you wish.

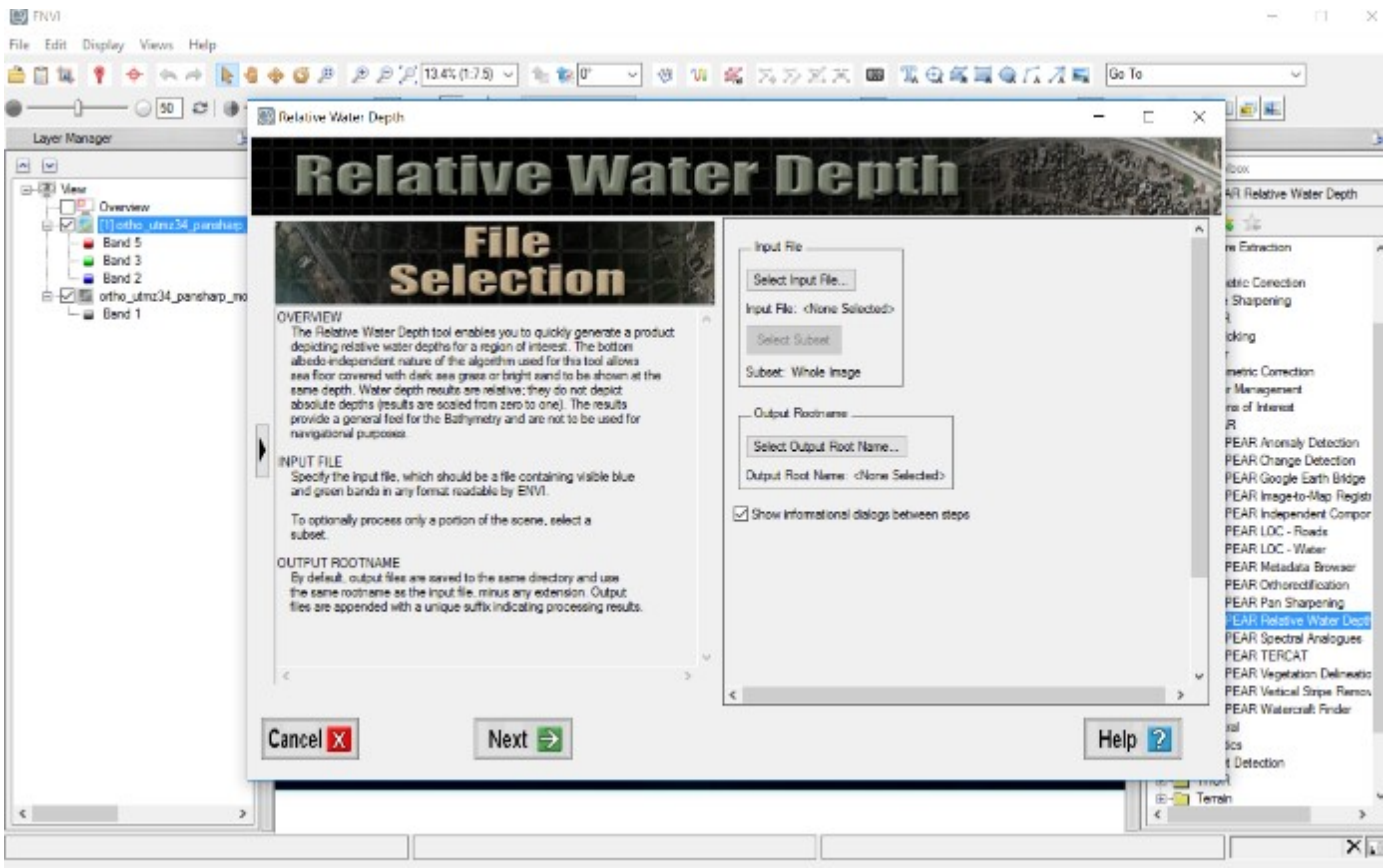


In order to continue the project, you will also need the ENVI software and for those who may not have it, they should send a message to the instructor so that a relevant downloading link can be provided.

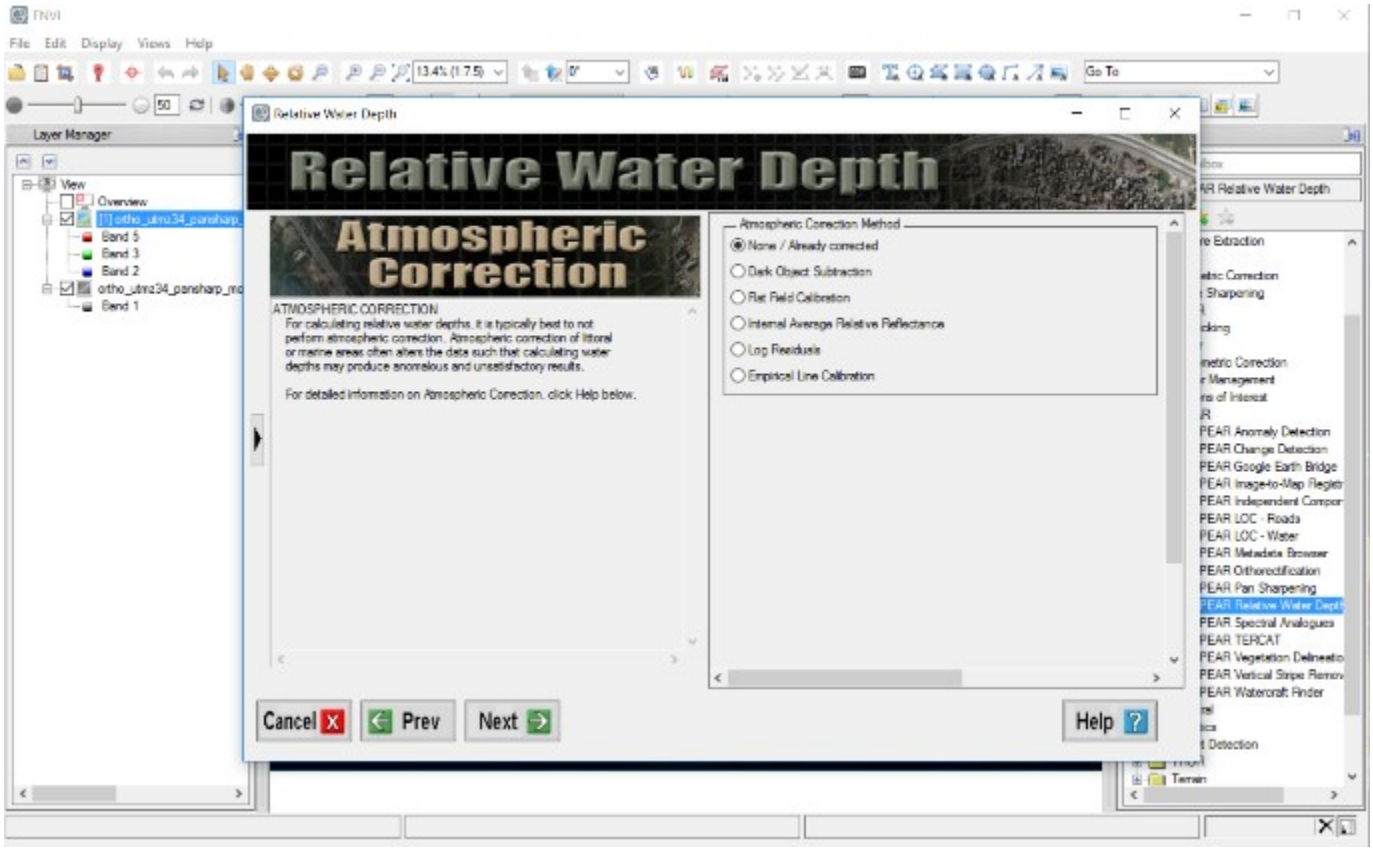
Within the ENVI environment, the SPEAR Toolbox→ the Relative Water Depth tool enables us to quickly create a bathymetric map of the area from the Landsat-8 satellite data (SDB=Satellite Derived Bathymetry) using the algorithm developed by Stumpf and Holderied (2003). The basic logic of the independent algorithm is that the seabed is covered with dark seaweed or with light

sand that appear to be at the same depth when actually it is not. The results of water depth are relative, as long as they do not depict absolute depths (the results range from zero to one). That means the analysis is not about the exact depth values but the relationship (difference) between the depths. The absolute depth is calculated after ENVI performs this algorithm by adjusting the results to true depths.

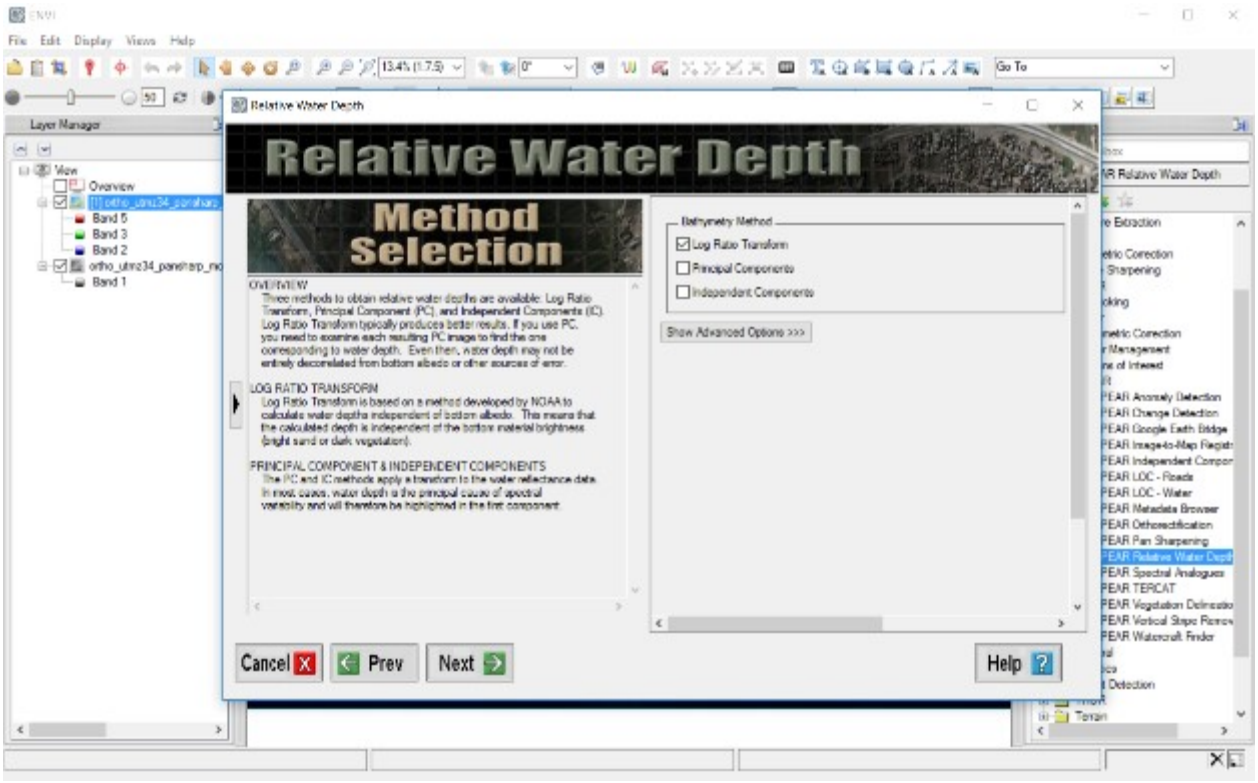
Knowing that depth is one-dimensional, we understand that it takes a single input of depth value to get real values. Beyond the depth, however, there is the uncertainty of identification of the measurement scale as one is measured in meters and the other in wave phases, which can create significant differences in the adjustment of depth and image interrelationship. For the above reasons, the software requires *the insertion of at least two random points with an already known depth* to carry out the adjustment. These points are taken from the bathymetry of the multi-beam sonar, making sure that the points have different depths and taking into account that the projective system of the data is EGSA 87, while the satellite image is using UTM or WGS84 so you should carefully convert between coordinate systems.



In the Select Input File we select the satellite image Landsat-8 that you downloadedand in the Select Output Root Name the folder you want to save the output Satellite Bathymetry.Then, we press Next.

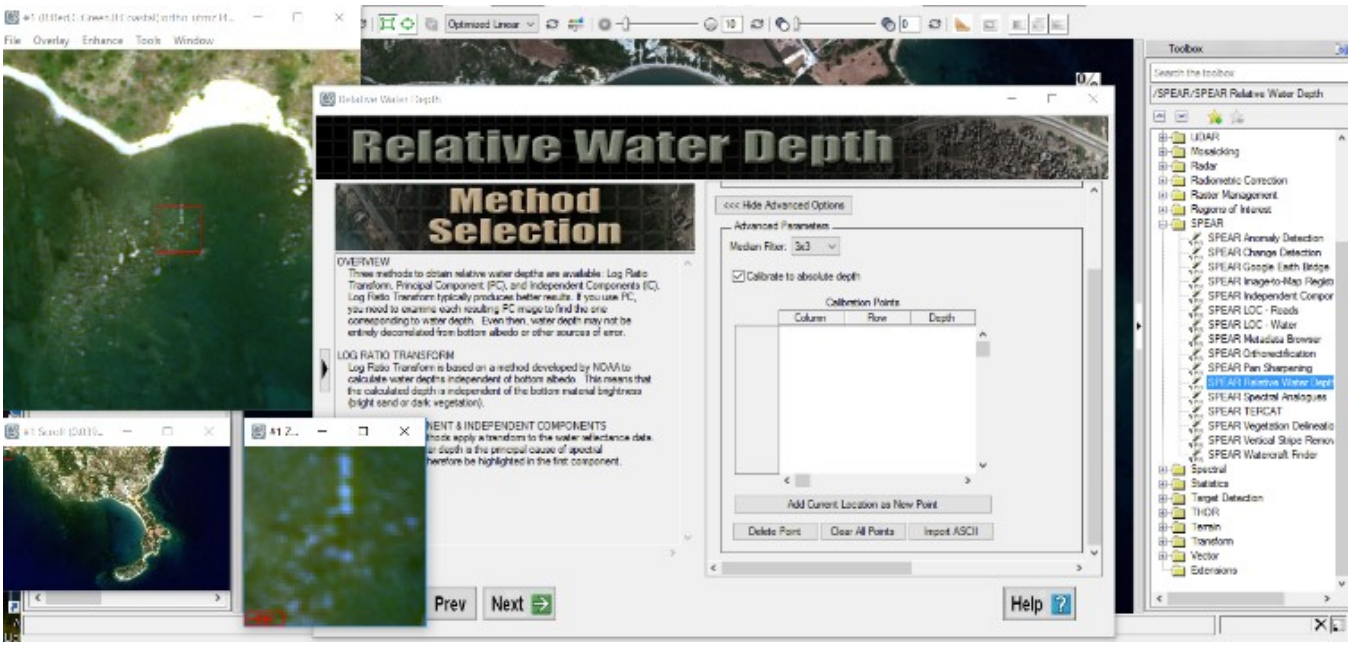


At this stage the software lists if and what method of atmospheric correction has been carried out. The Landsat-8 C 2/L2 downloaded satellite image is atmospherically corrected and for this reason we select None / Already corrected and press Next. At this stage, linear regression is performed on the data using the log ratio transformation.



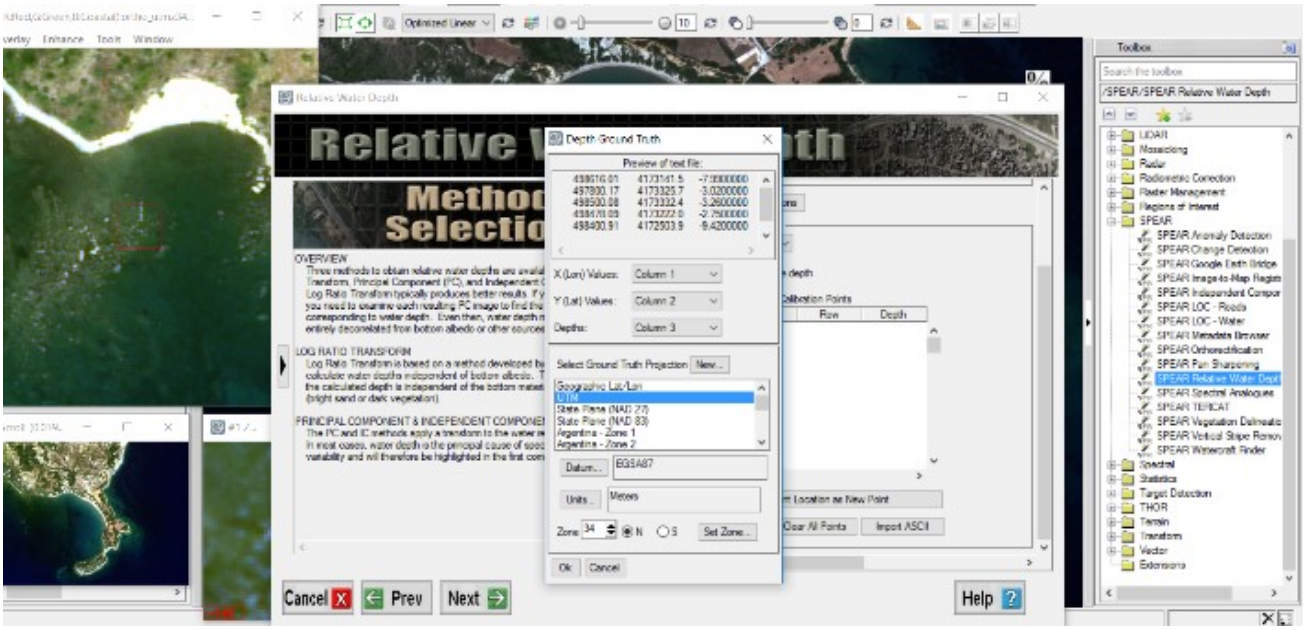
Transform Log Ratio Transform.

After we have finished with the corrections and transformations, we go to ***Advanced Parameters*** and select ***Calibrate to absolute depth*** i.e. to make corrections for absolute depth. In Import ASCII we import the bathymetry file from the two sonar measurements we selected and which must be in ***ASCII*** format.



Insert bathymetry from known places.

We are also given the opportunity to apply an average value smoothing filter for the image. Practically, in the case where in neighboring pixels there are large spectral differences, these are smoothed out and take values equal to an average value. The software gives the option for square windows of 3, 5, 7, 9, 11 and 13 pixels, respectively, as well as the option not to apply a filter which you will choose for the reason that we want as much accurate information as possible and not an estimate of the depth. For the reference system we choose the UTM and zone 34 and for the Datum the WGS84.



Choice of Datum and reference system.

The software will calculate the bathymetry of the area from the Landsat-8 satellite data and you will have to compare them with the bathymetry of the multiple beam sounder for general conclusions.