Interreg
Greece-Italy
European Regional Development Fund

EUROPEAN UNION

Triton

Lead Partner
REGIONE PUGLIA

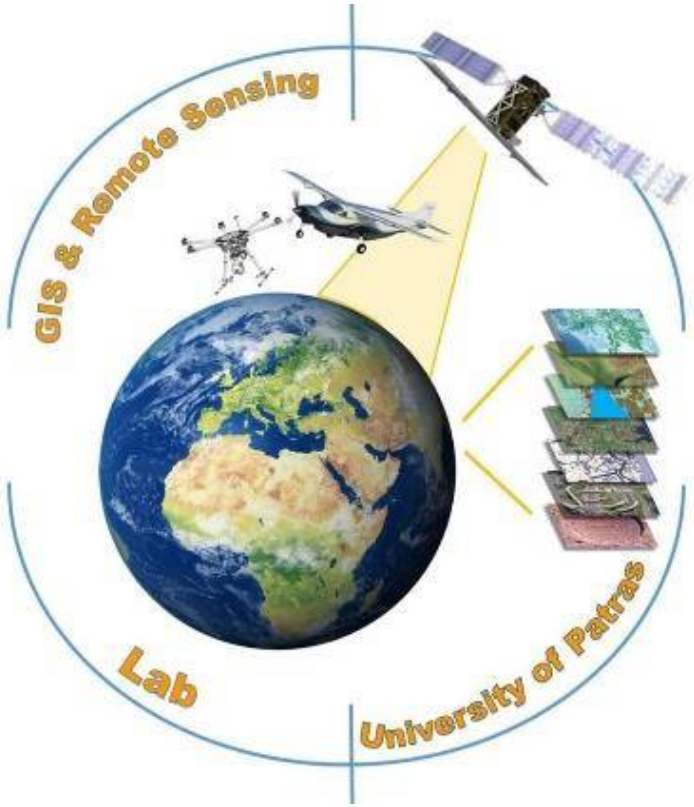
Technical support
arti
Agenzia regionale per la tecnologia e l'innovazione

Project Partners
REGION OF WESTERN GREECE
CMCC
ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ
EGTC Ellinii Poli

Remote sensing applications in the frame of TRITON project

Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

Personnel involved in the Triton project



- Konstantinos Nikolakopoulos, Associate Professor
- Dionissios Apostolopoulos, Geologist, M.Sc., Ph.D candidate
- Dimitrios Konstantinopoulos Geologist, M.Sc.

Remote Sensing applications in the frame of TRITON

Data collection

- Medium to very high resolution satellite data
- Airphotos
- USV data
- UAV data

Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

Remote sensing data spatial resolution and map scale

There is a mathematical formula connecting the spatial resolution of remote sensing data to the map scale

“Map scale = spatial resolution * 2500”

For example:

1 meter pixel size ➔ 1/2.500 map scale

Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

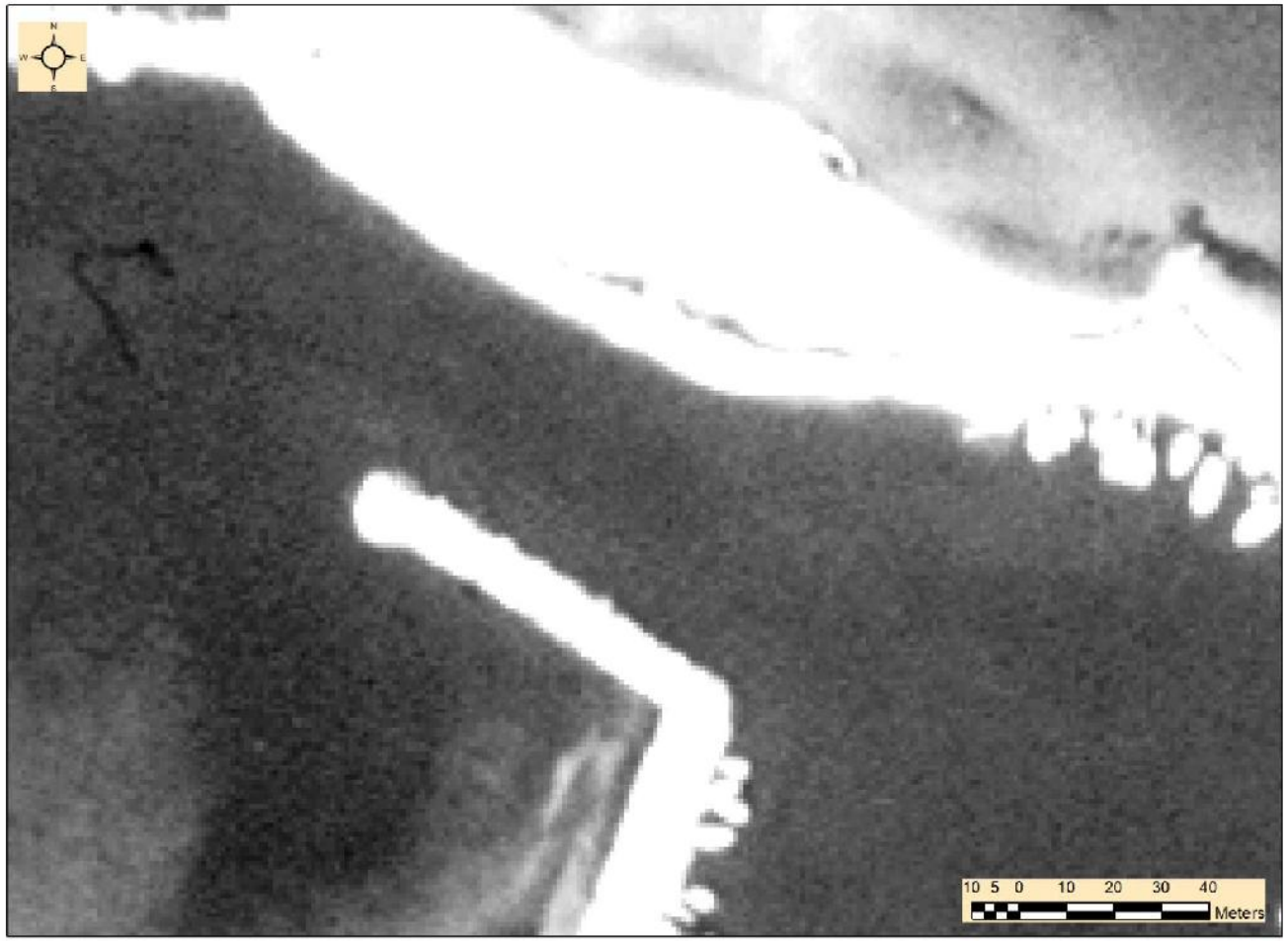
Sentinel data 10m

Map scale = 1/25.000

RGB combination 432

Airphotos 1m

Map scale = 1/2.500

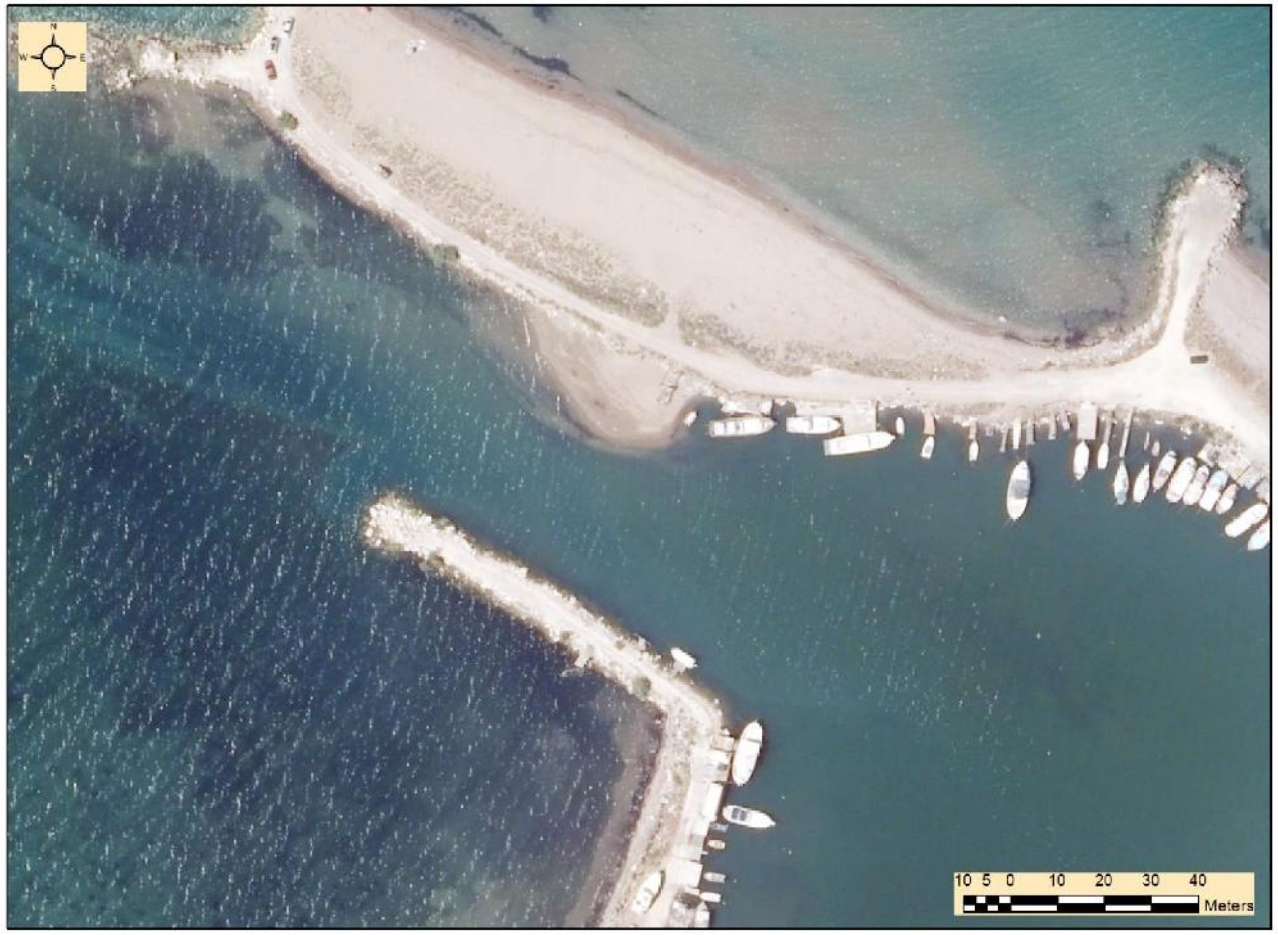


Worldview-2 data 0,5m

Map scale =1/1.250

Greek Cadastral data 0,25m

Map scale = 1/625



UAV data 0,04m

Map scale = 1/100

Medium resolution satellite data

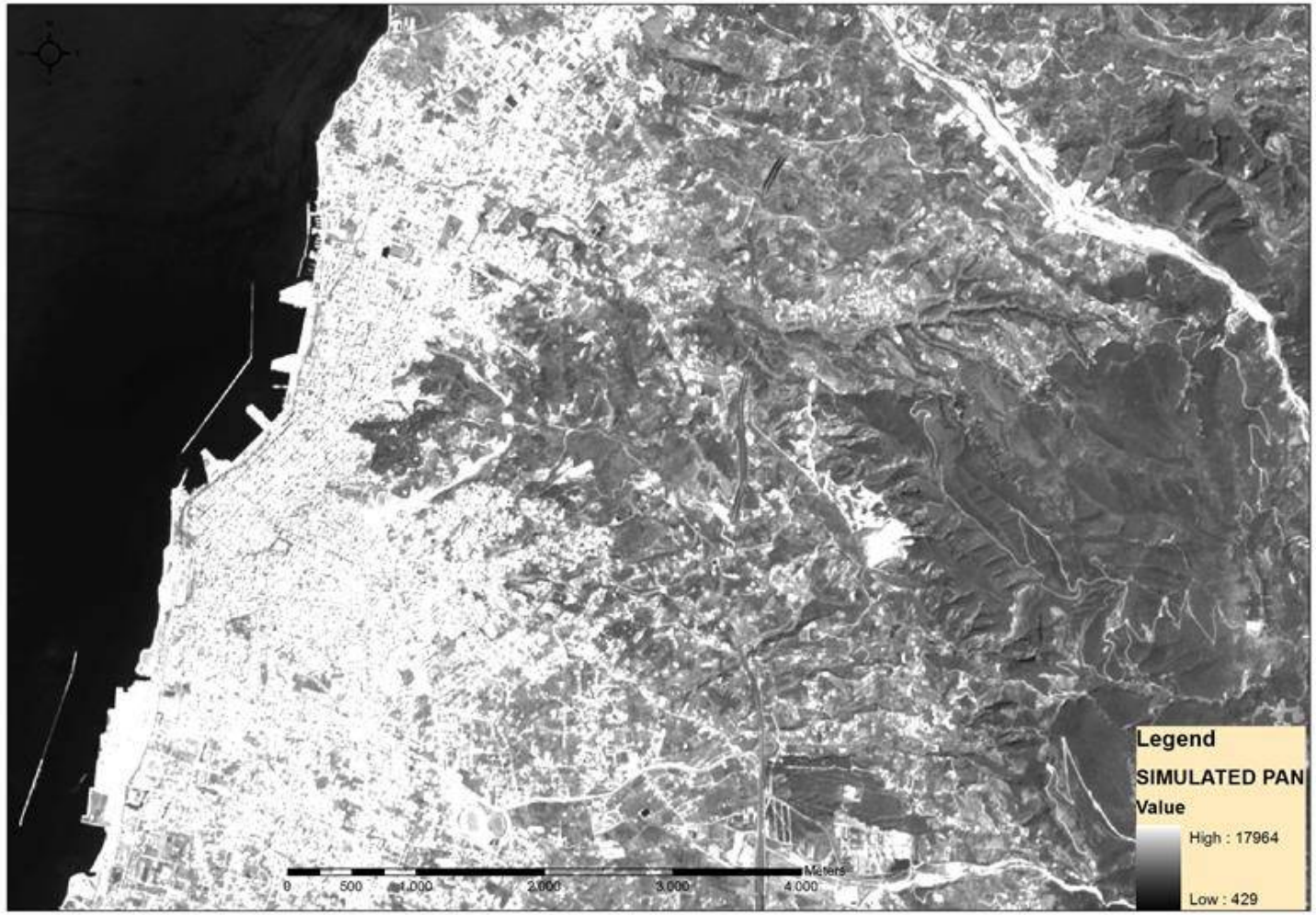
Assess the suitability of Landsat 8 and Sentinel MSI data for coastline monitoring and estimate the accuracy

Medium resolution satellite data

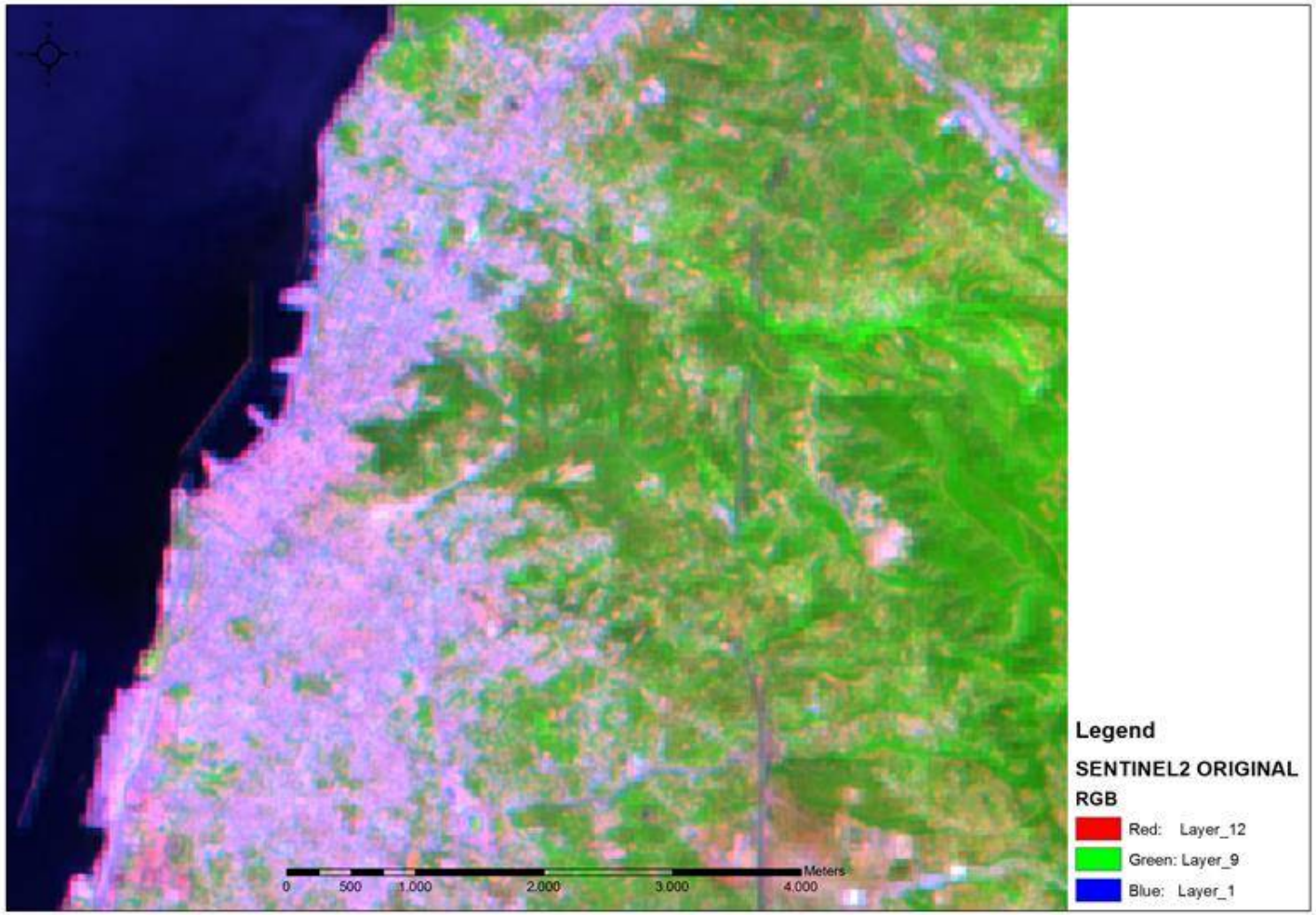
1. Panchromatic band simulation for Sentinel
2. Data fusion
3. NDVI
4. NDWI

Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

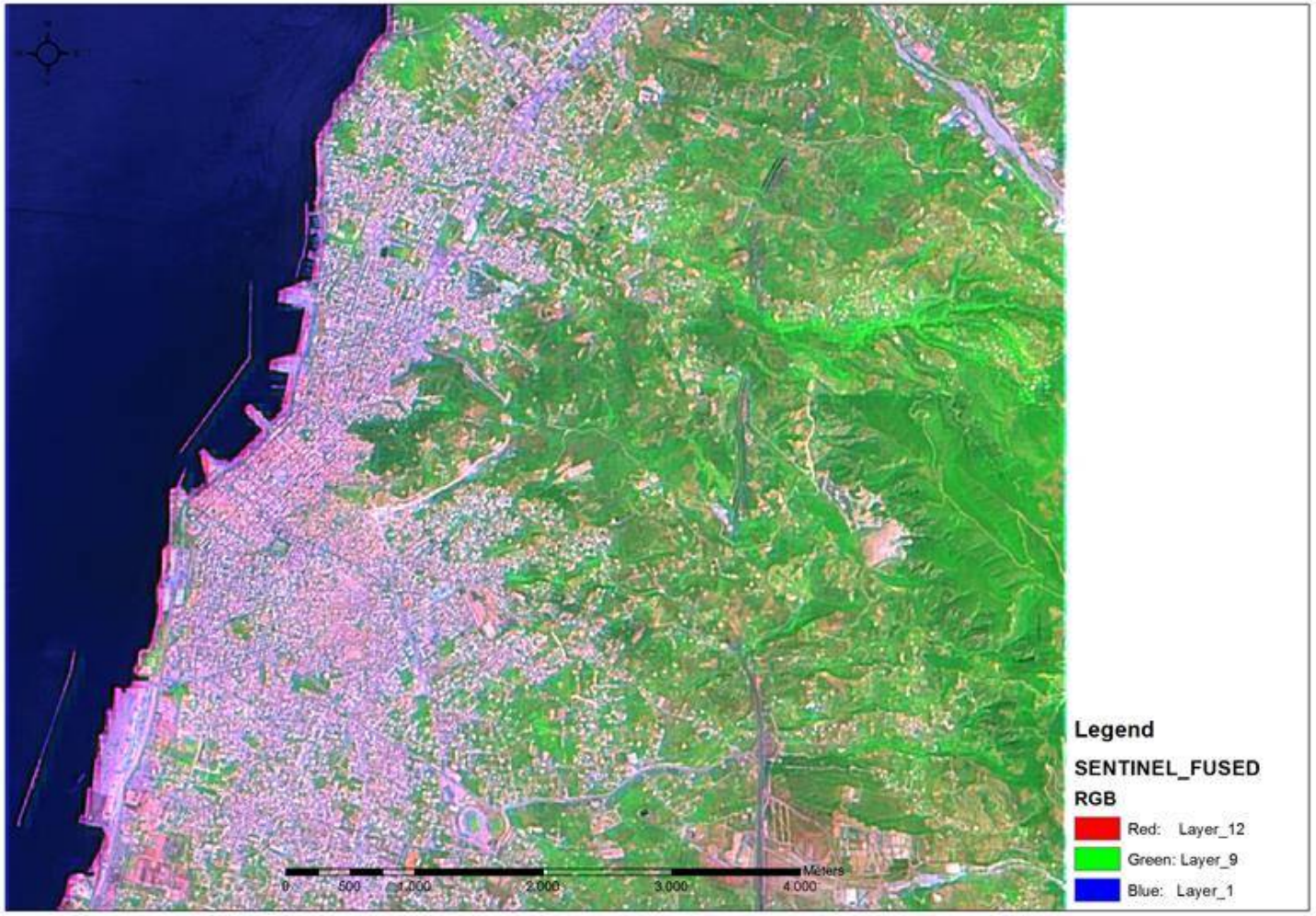
Sentinel-2 Panchromatic band simulation



Sentinel-2 original multispectral bands

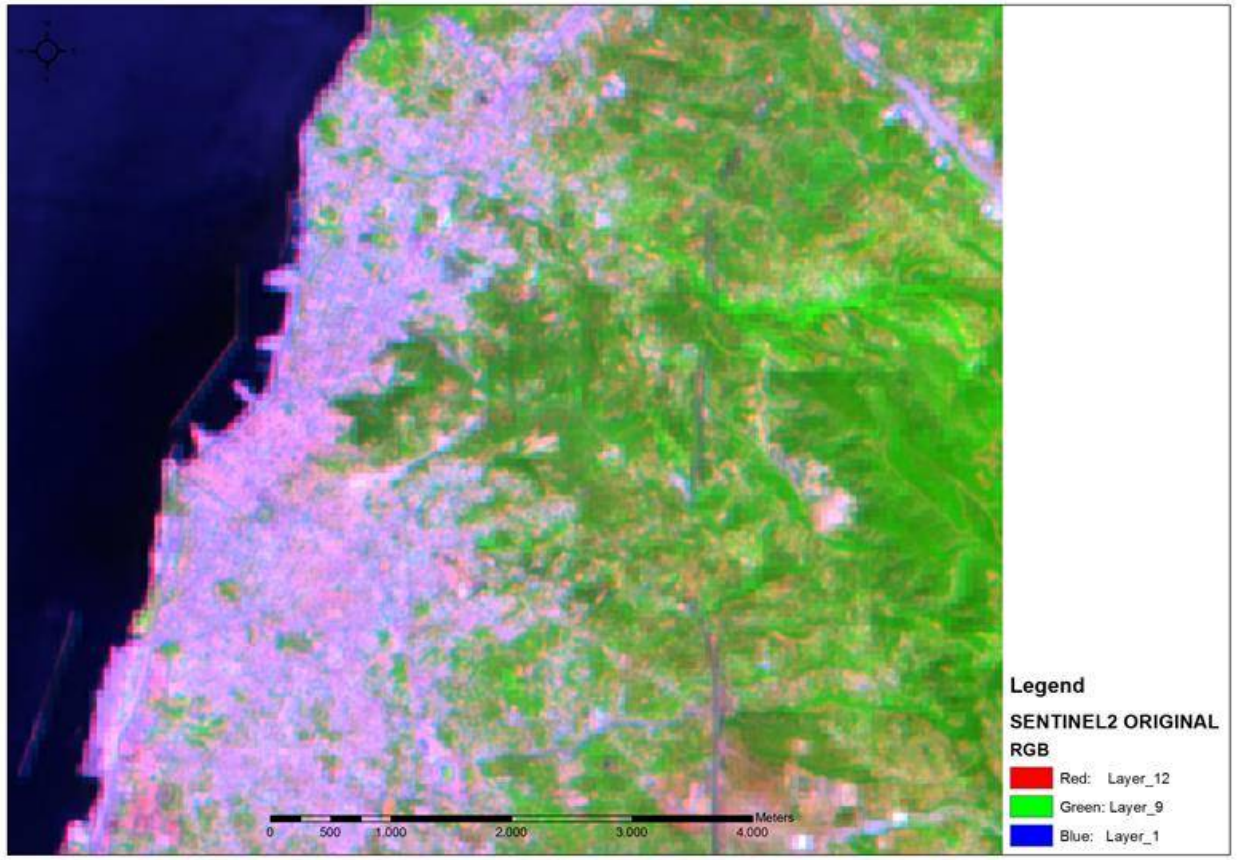


Sentinel-2 fused bands

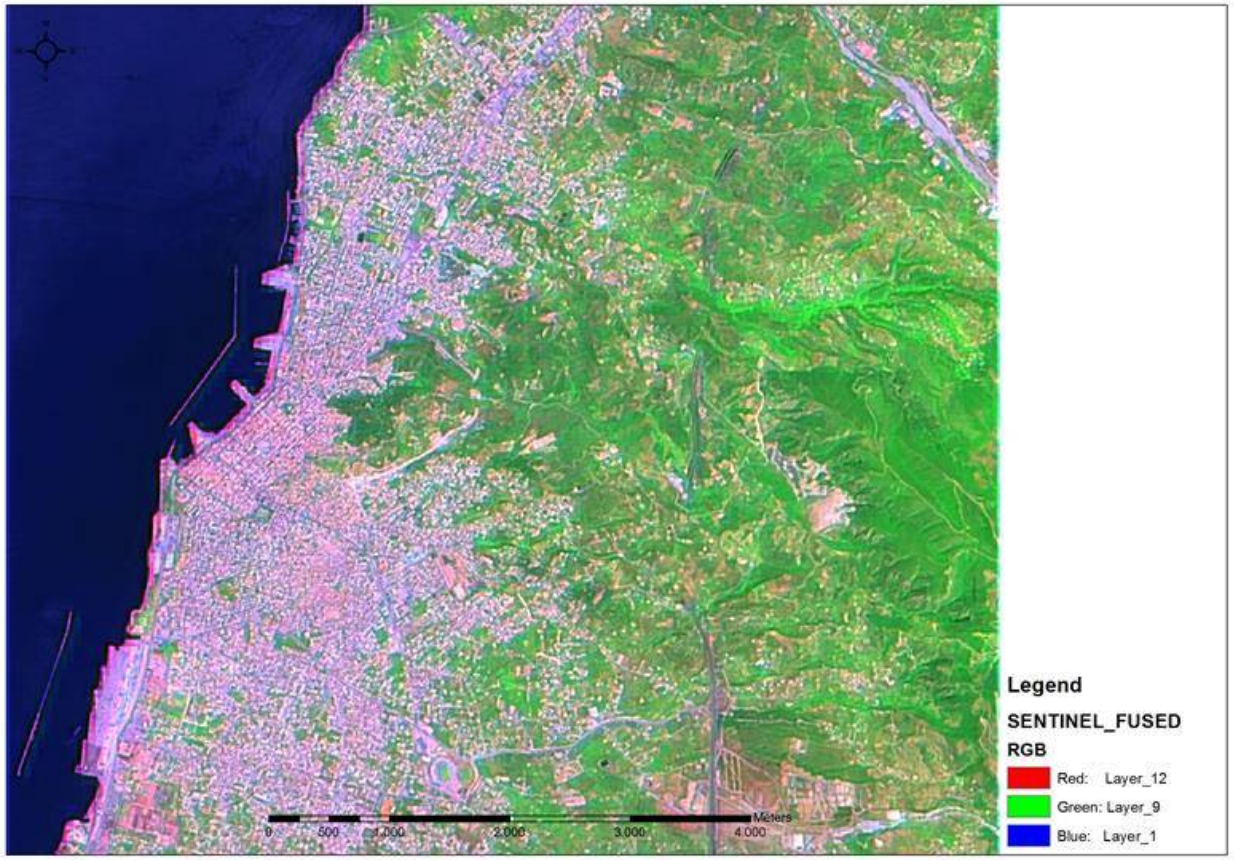


Sentinel-2 original vs fused bands

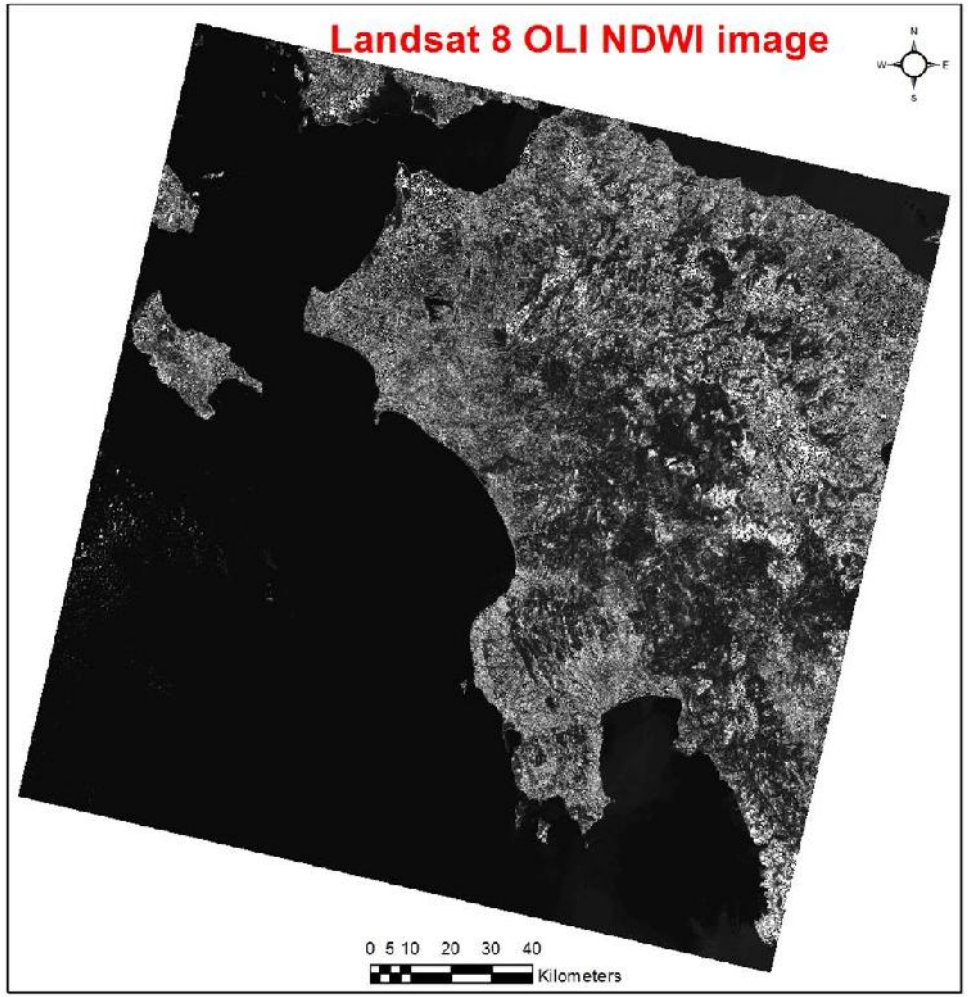
Original data



Processed (fused) data



Medium resolution satellite data

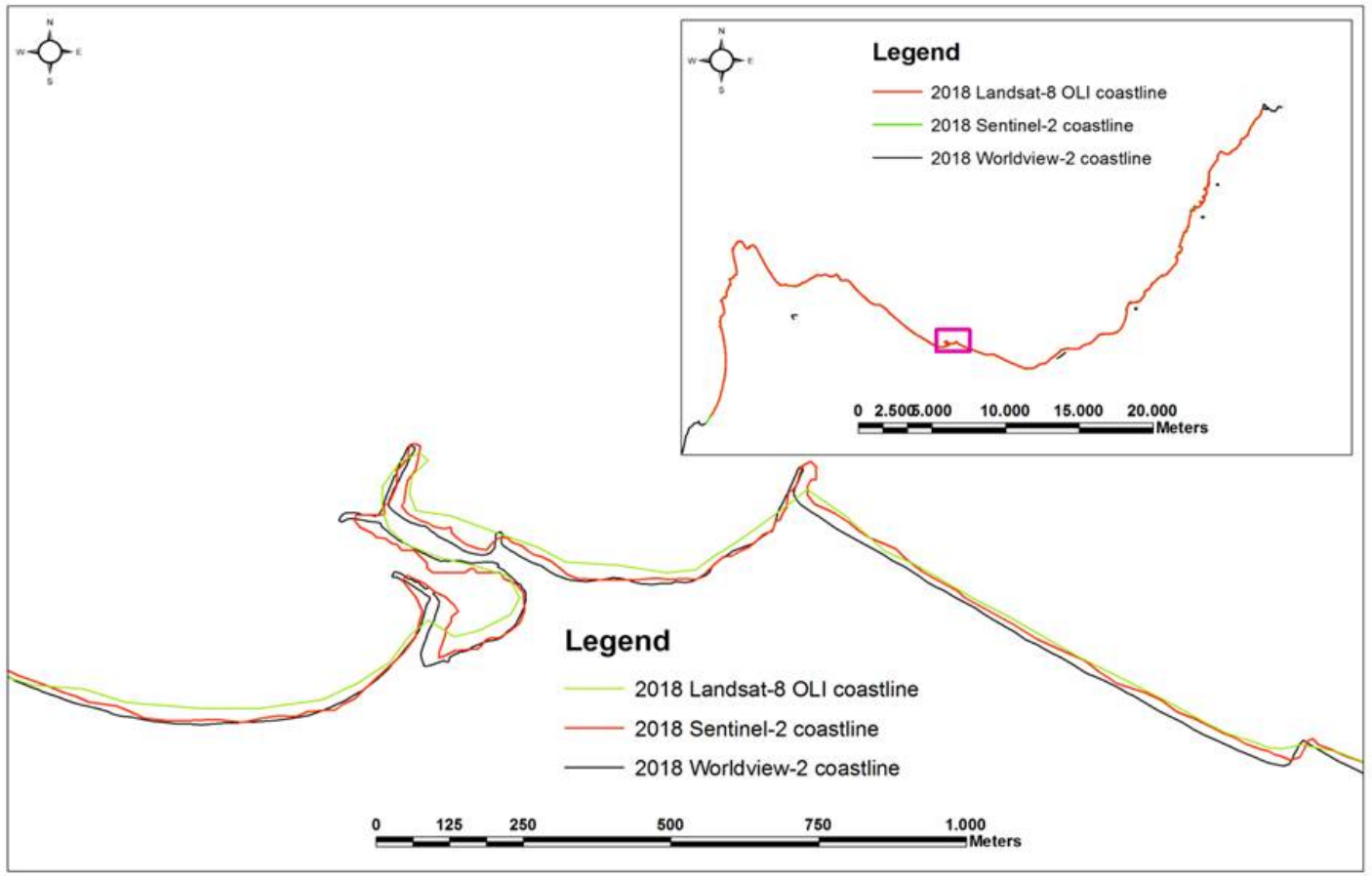


Landsat 8 NDWI image classification

Landsat 8 NDVI image classification

Sentinel-2 NDWI image classification

Accuracy of medium resolution satellite data



Assessment and Quantification of the Accuracy of Low- and High-Resolution Remote Sensing Data for Shoreline Monitoring

Dionysios N. Apostolopoulos and Konstantinos G. Nikolakopoulos

ISPRS Int. J. Geo-Inf. **2020, *9*(6), 391;**
https://doi.org/10.3390/ijgi9060391

Very high resolution remote sensing data

Map the diachronic evolution of the coastline from 1945 to 2018

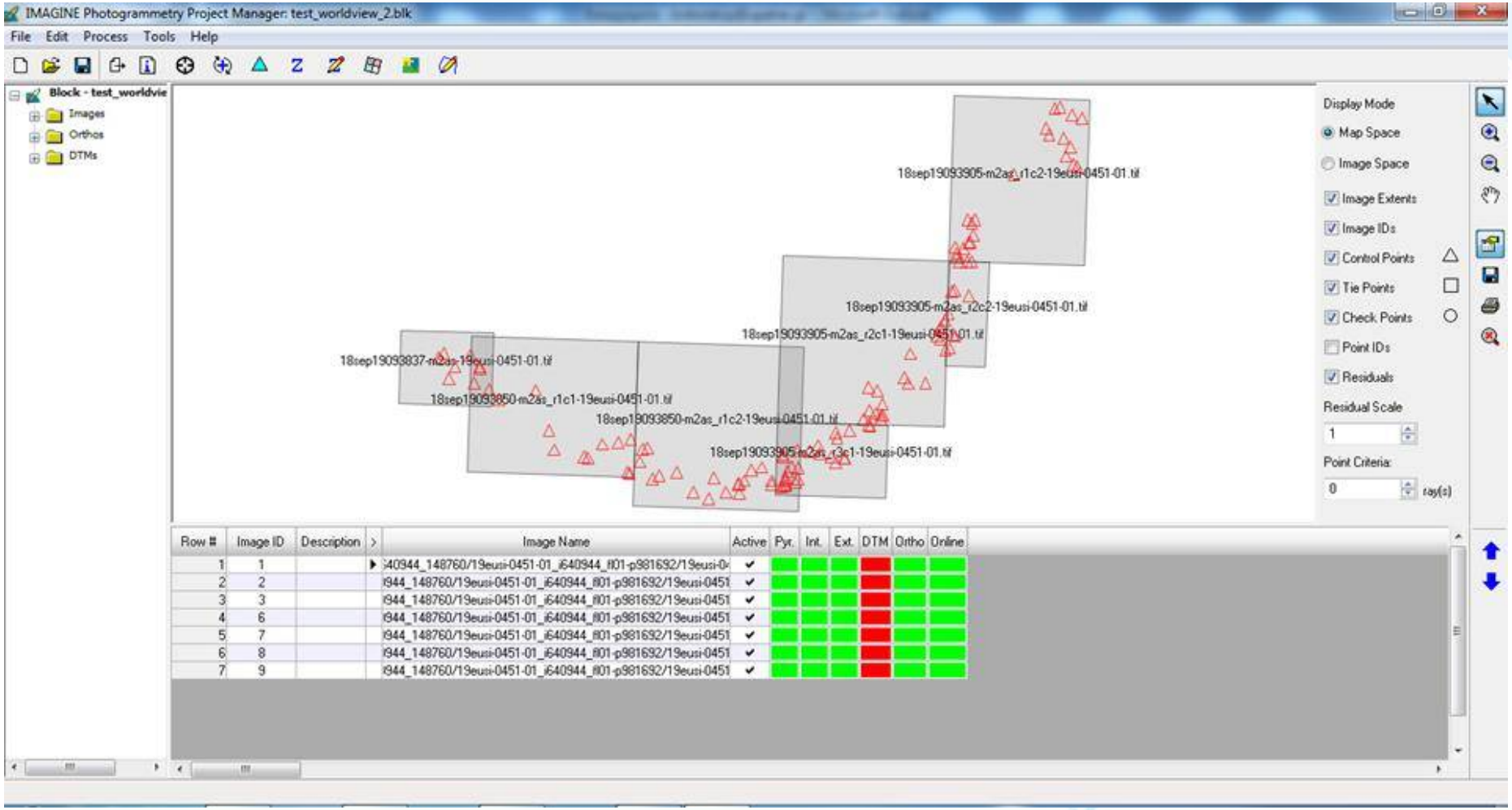
Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

Very high resolution remote sensing data

Data Products	Resolution (meters)	Year of Image Acquisition	Source
Airphoto	1	1945	Hellenic Military Geographical Service
		1996	
Satellite imagery	2	1973	USGS
Geoeye	0,5	2012	Digital Globe
Worldview-2	0.5	2018	Digital Globe

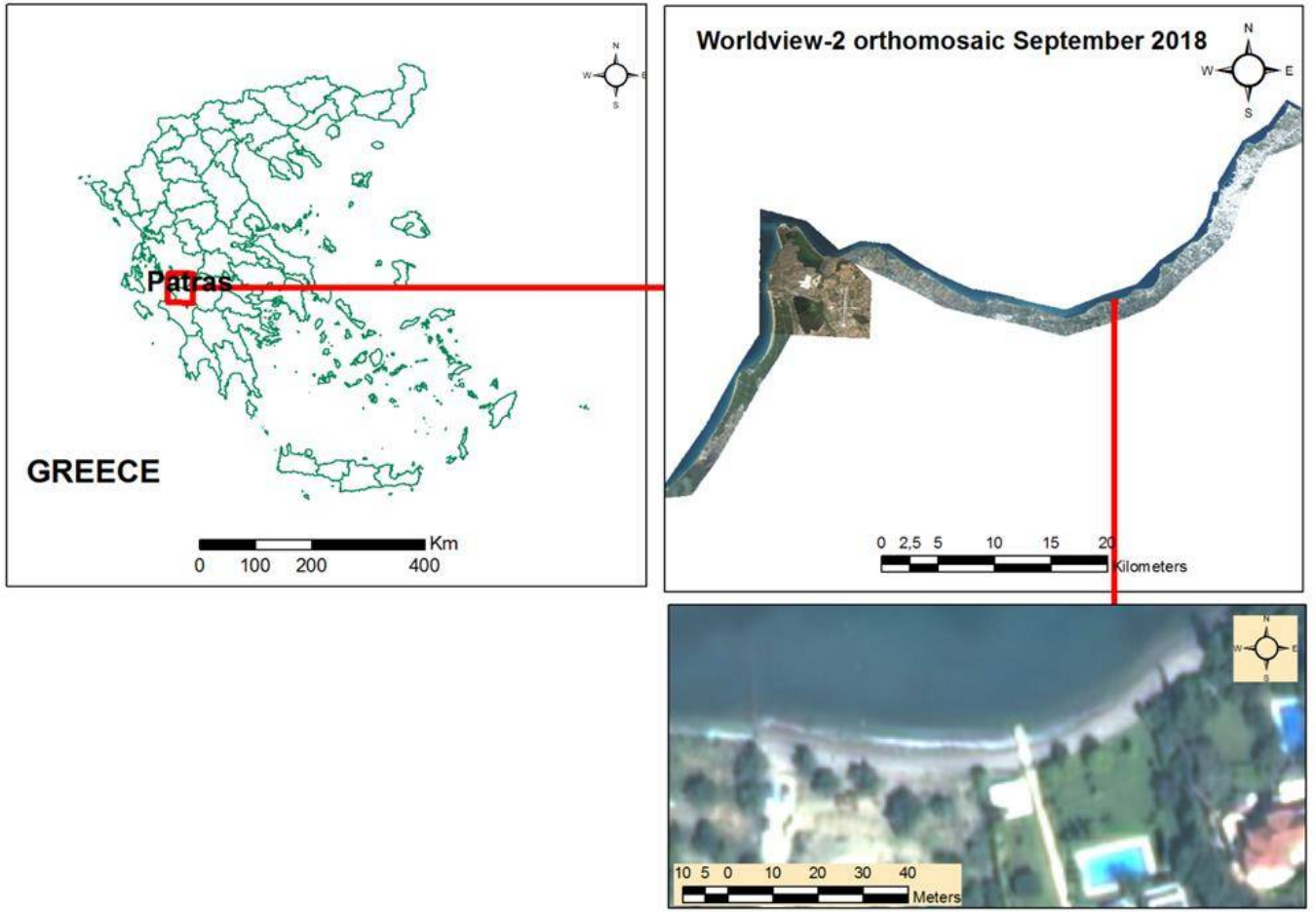
Very high resolution remote sensing data

Orthorectification of Worldview-2 data using Leica Photogrammetry Suite



Very high resolution remote sensing data

Orthorectification of Worldview-2 data using Leica Photogrammetry Suite



REMOTE SENSING AND GIS : Rio Patras

Scale 1:10,000
1945

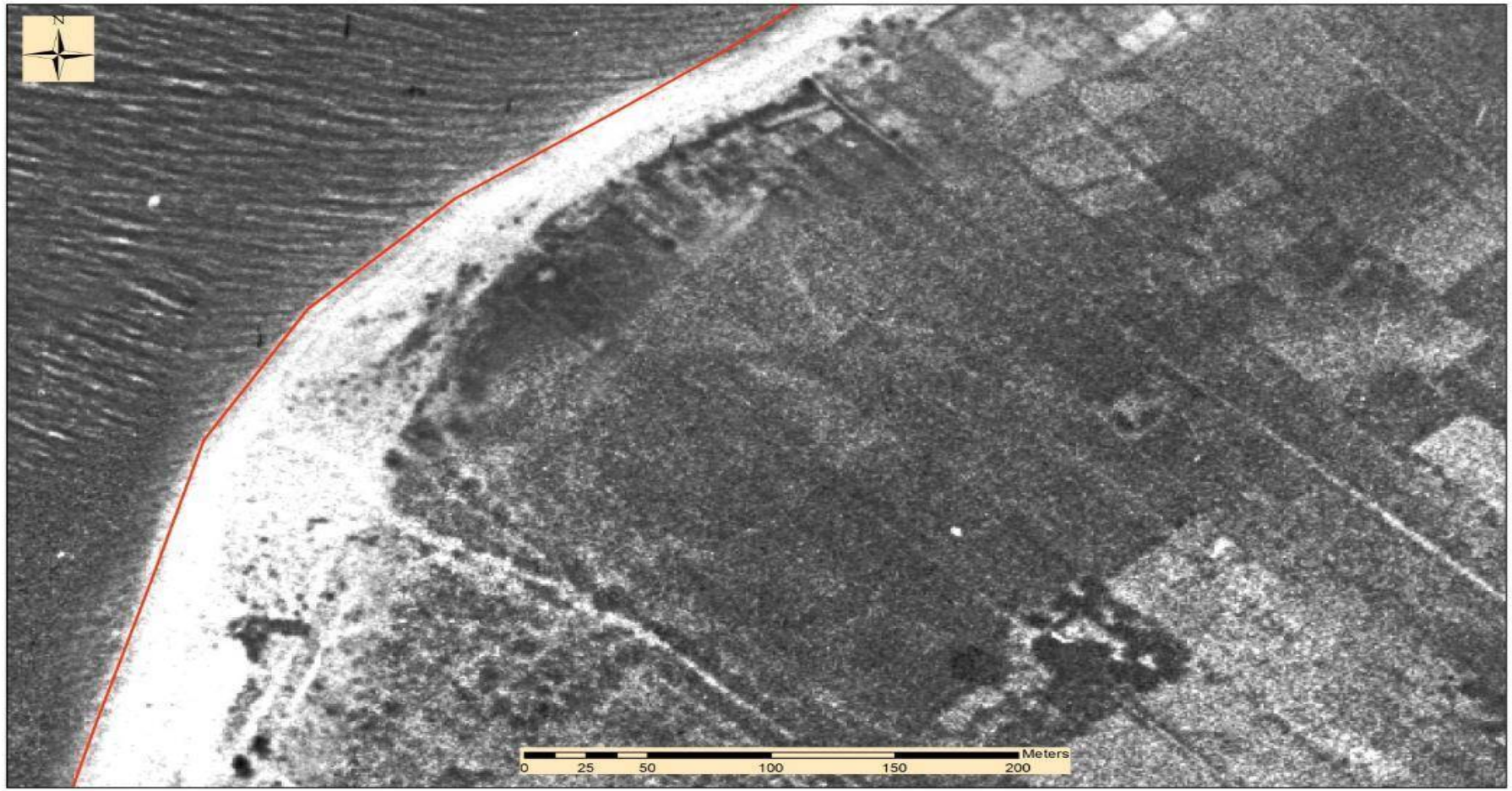
REMOTE SENSING AND GIS : Rio Patras

Scale 1:10,000
1996

REMOTE SENSING AND GIS : Rio Patras

Scale 1:10,000
2012

REMOTE SENSING AND GIS : Rio Patras



Scale 1:1,500
1945

REMOTE SENSING AND GIS : Rio Patras

Scale 1:1,500
1996

REMOTE SENSING AND GIS : Rio Patras

Scale 1:1,500
2012

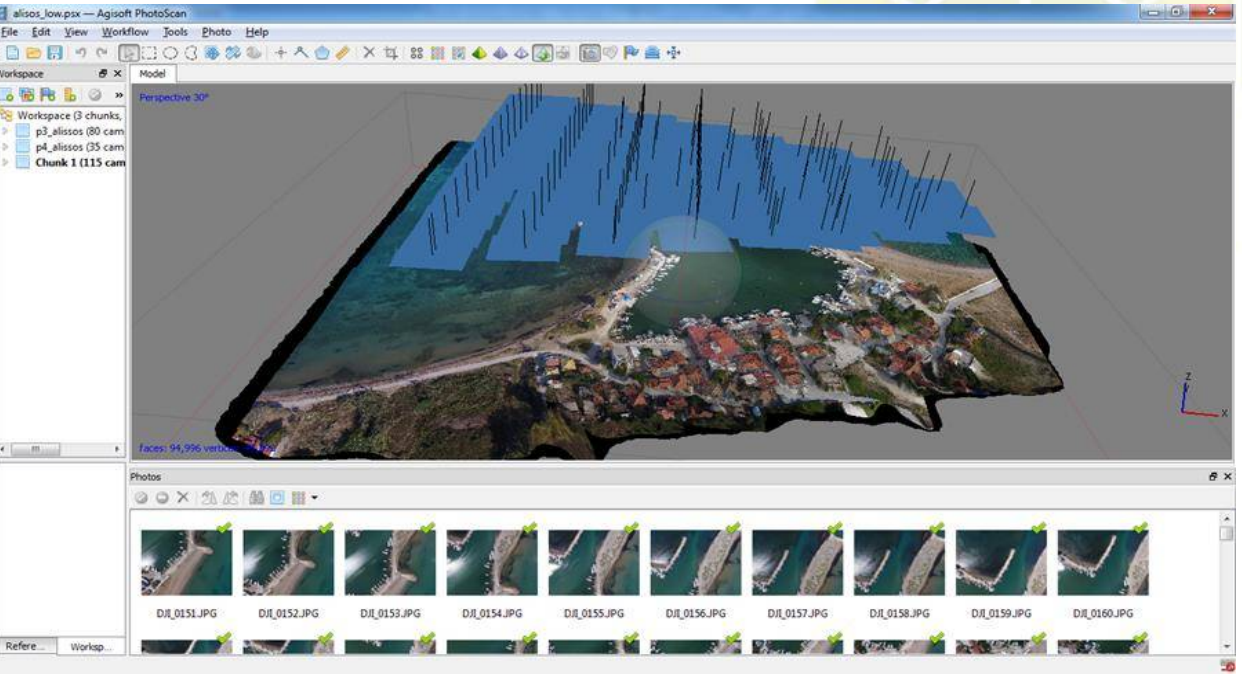
UAV data

Monitoring in specific areas with intense erosion

Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

UAV data

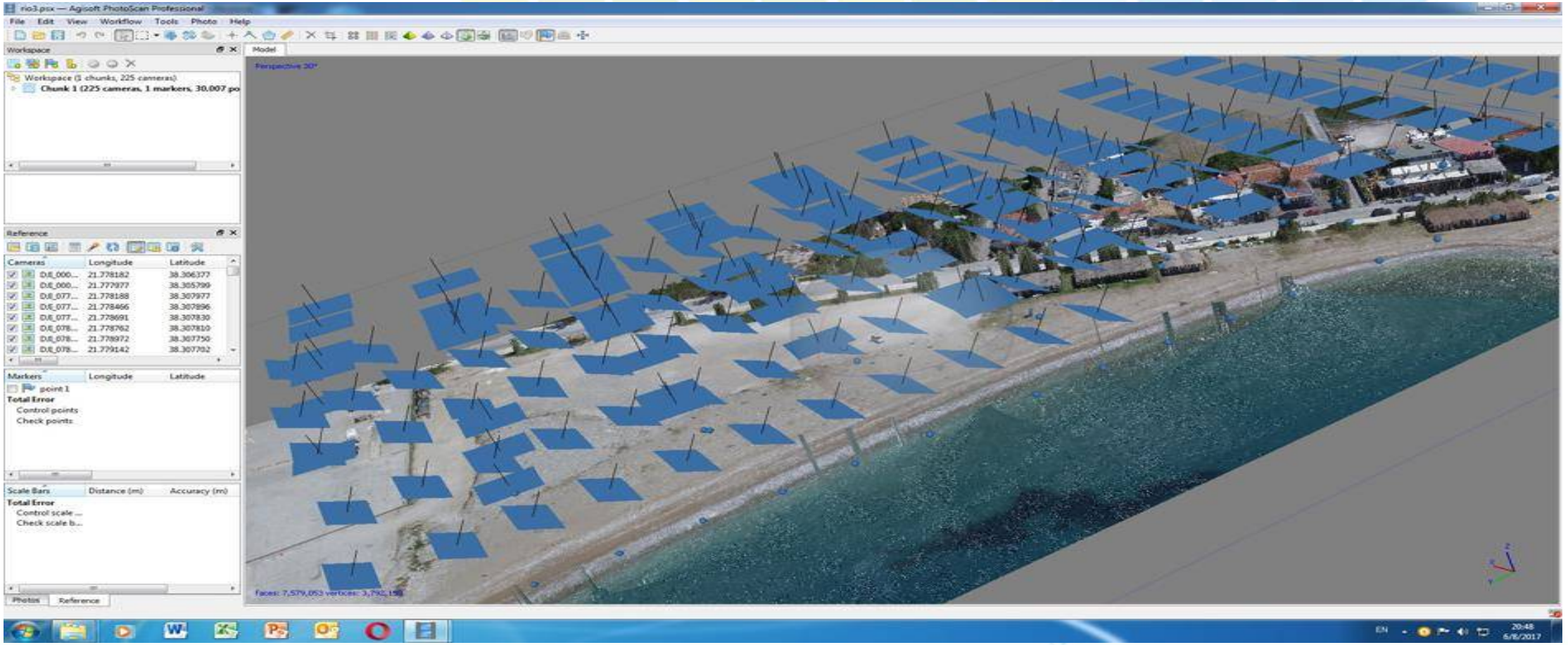
The UAV data are processed using Agisoft Photoscan Professional software and DSMs and orthophotos were created.



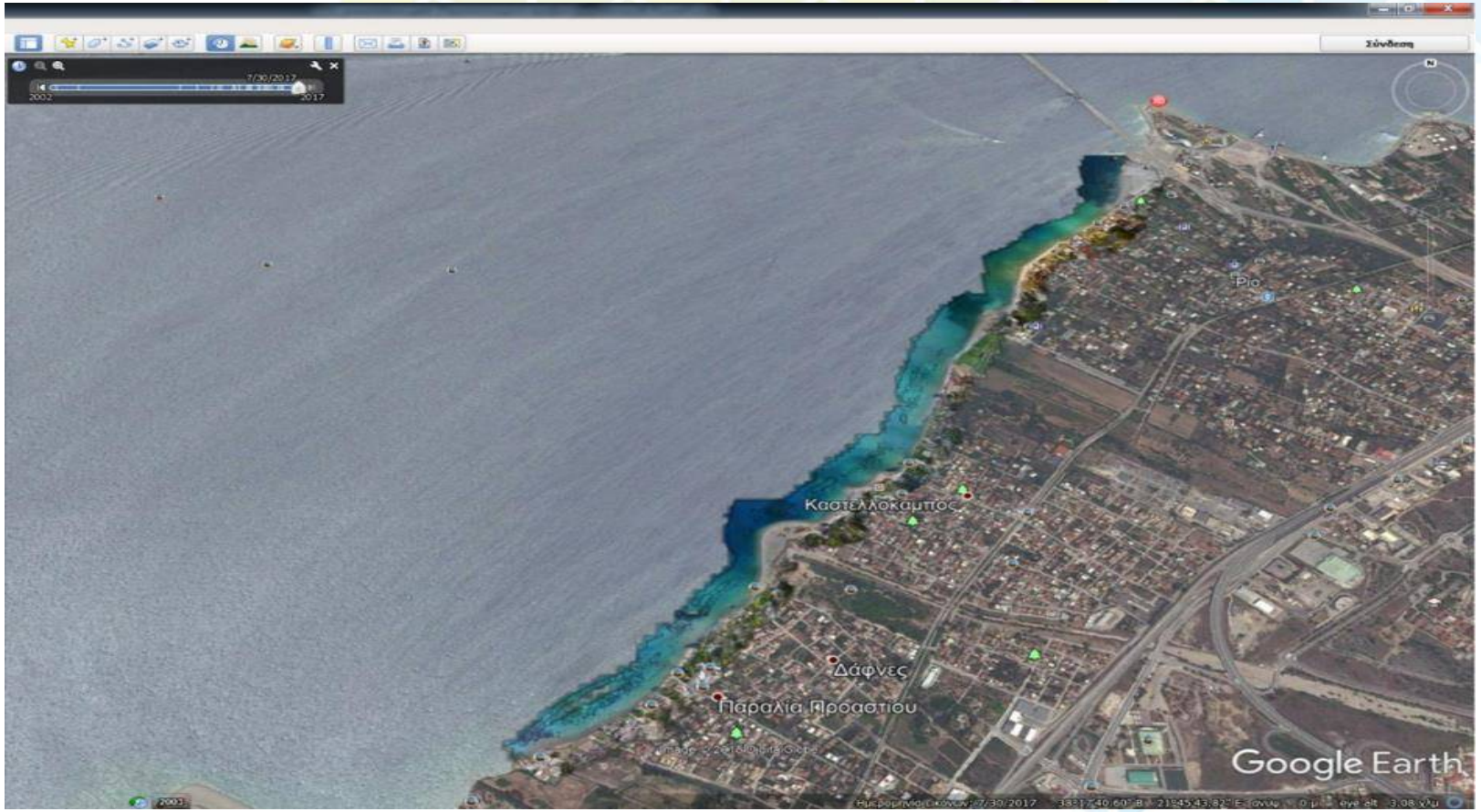
UAV data processing in Agisoft Photoscan Professional software

UAV data orthomosaic from Alissos area.

UAV: Rio Patras



UAV : Rio Patras



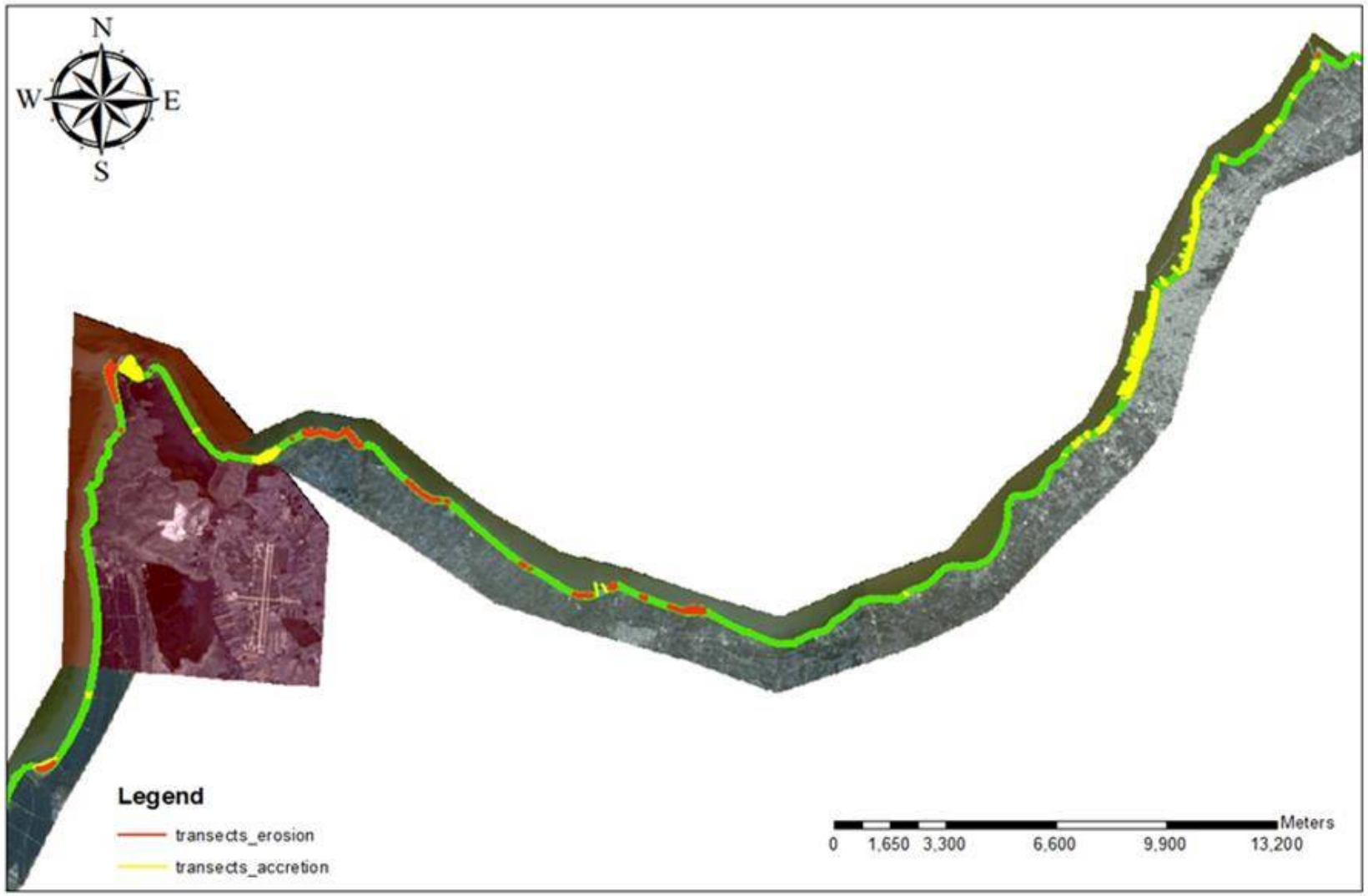
USV data

An Unmanned Surface Vehicle (USV) and very accurate SONAR were acquired. The specific small boat was also equipped with a Side Scan Sonar.

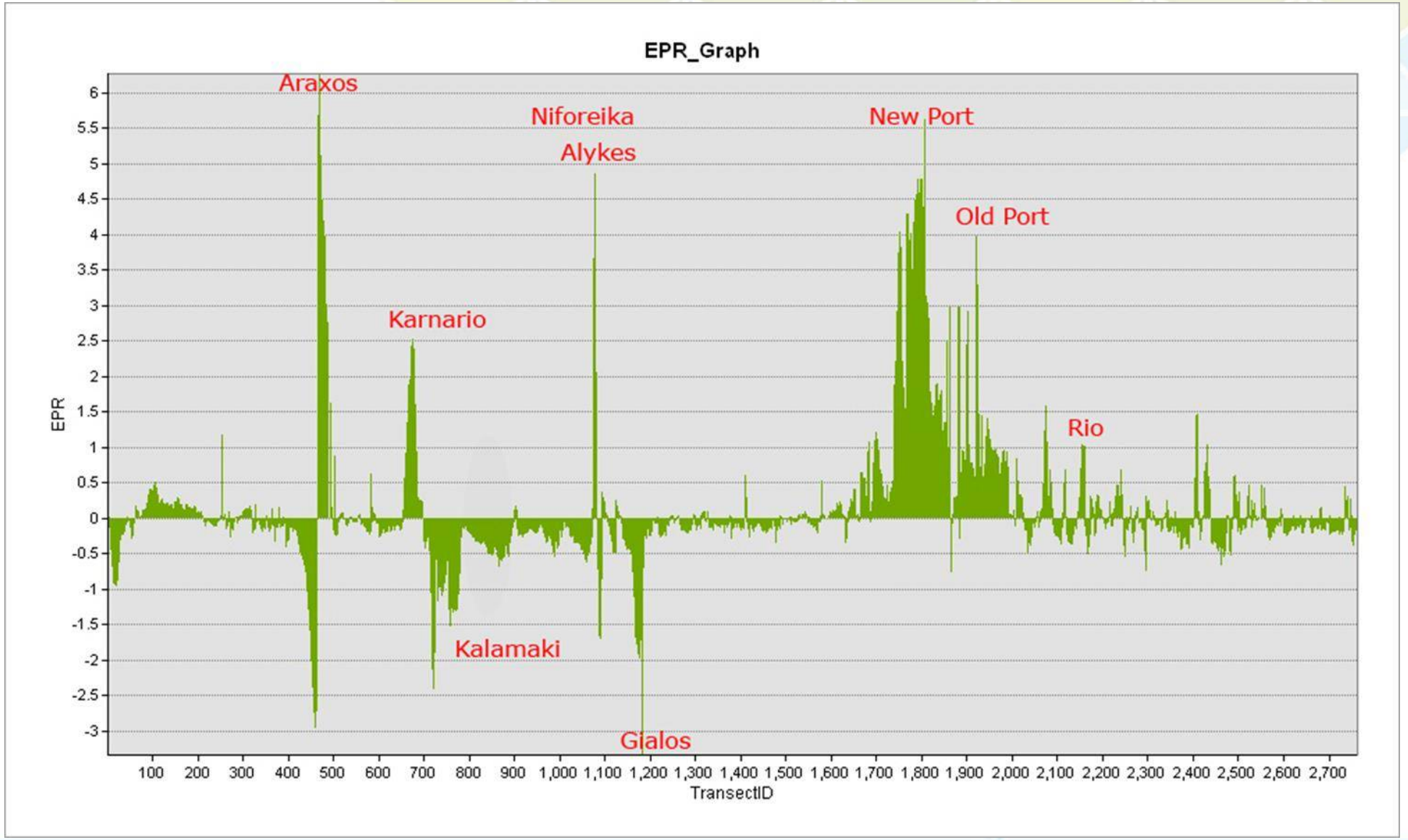
In areas where airphotos and satellite data processing detect major changes in the shoreline USV surveys provide very accurate data of the sea bottom

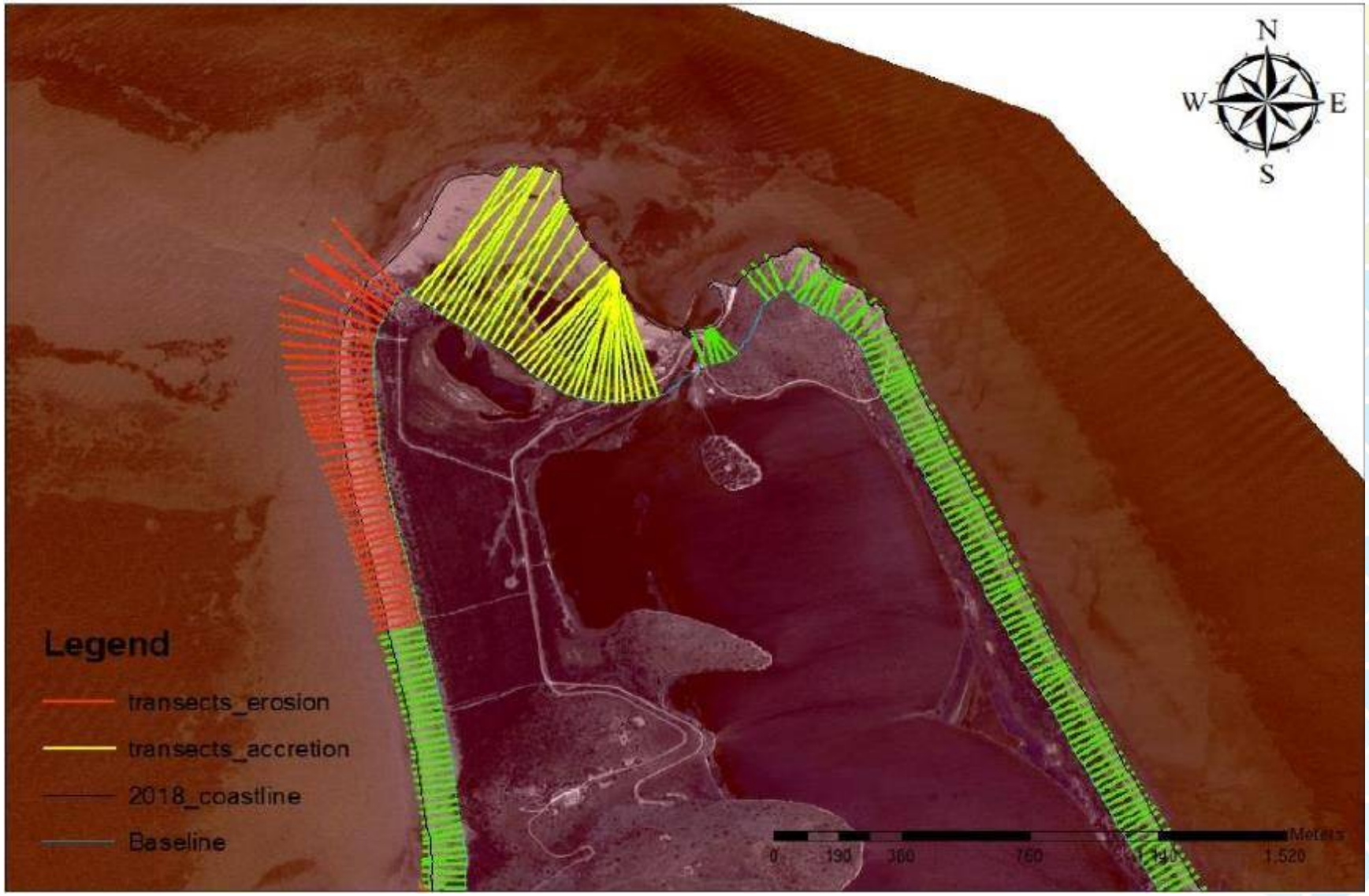
RESULTS

Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy



Map of the shoreline displacement from 1945 to 2018. Red color represents areas where the erosion was higher than 30m, Yellow color marks areas where the deposition has overpassed 30m. Areas where the shoreline displacement is lower than 30m are presented with green color.


EPR_Graph
Araxos
Niforeika
Alykes
New Port
Old Port
Karnario
Rio
Kalamaki
Gialos
EPR
TransectID
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
100 200 300 400 500 600 700 800 900 1,000 1,100 1,200 1,300 1,400 1,500 1,600 1,700 1,800 1,900 2,000 2,100 2,200 2,300 2,400 2,500 2,600 2,700

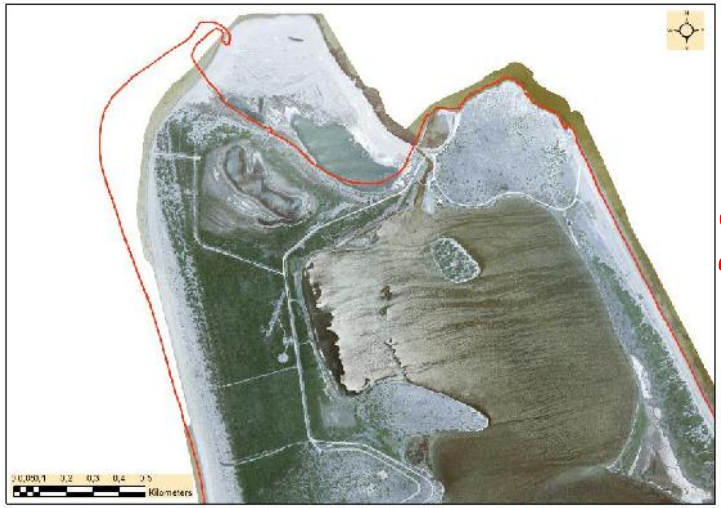


Site 1: Araxos Cape

The erosion is observed in the western part of the cape. **From 1945 to 2018 it was observed that the beach eroded about 94m at a rate equal to -1.28m / year**. **In the eastern part of the cape there is a strong accumulation of about 333m with a rate of 4.54m / year.**

Project co-funded by European Union, European Regional Development Funds (E.R.D.F.) and by National Funds of Greece and Italy

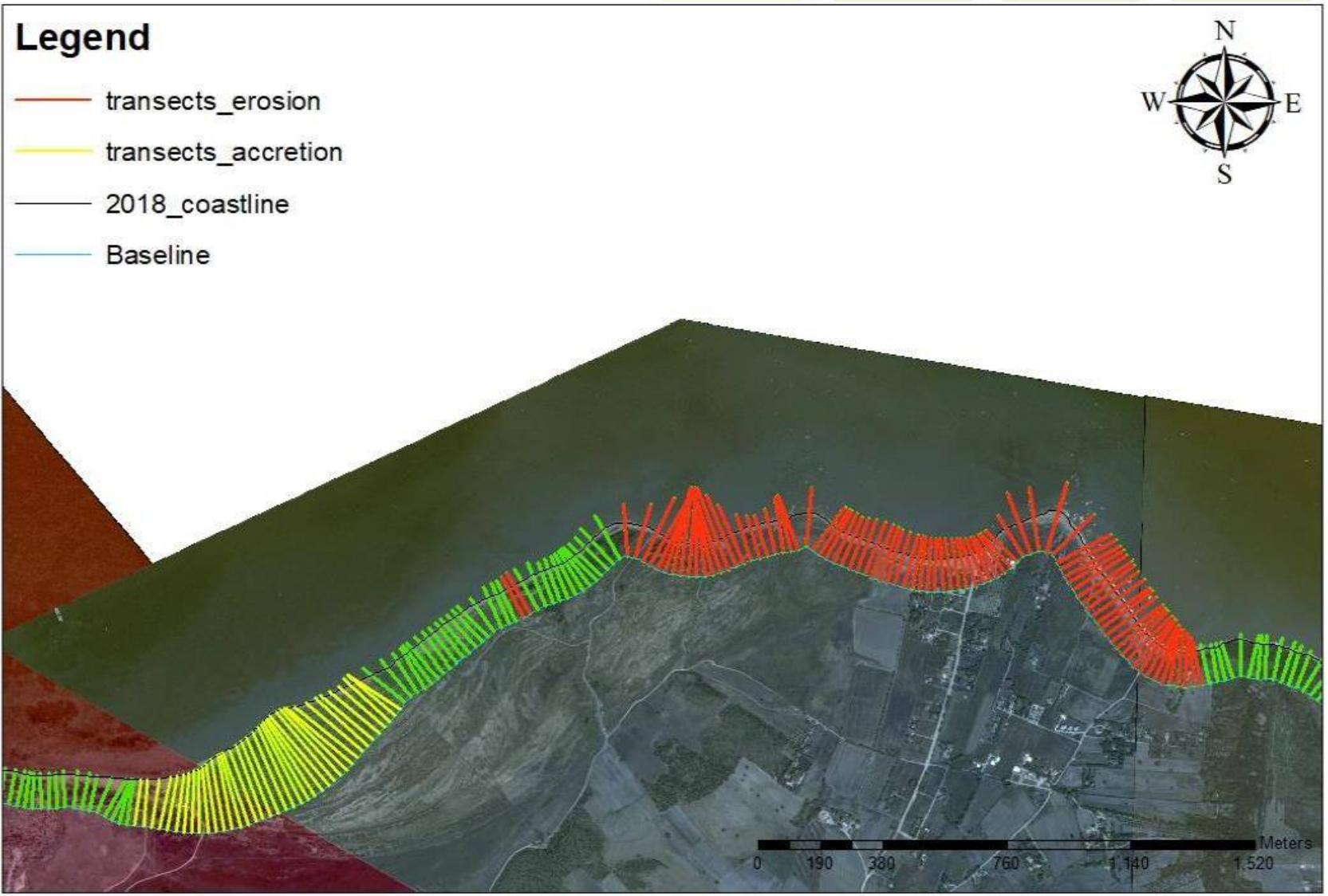
1945



2016

1960

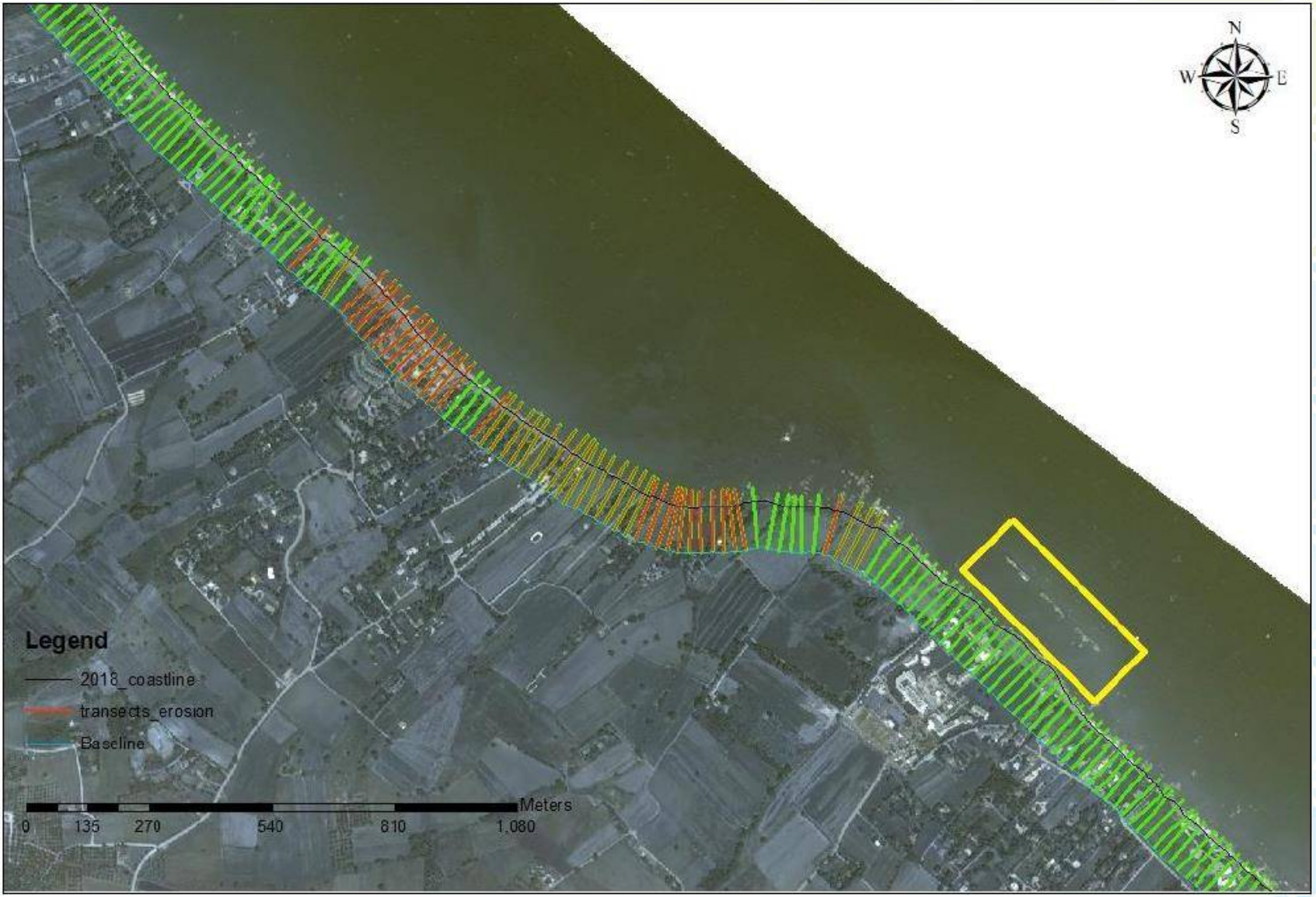
2018



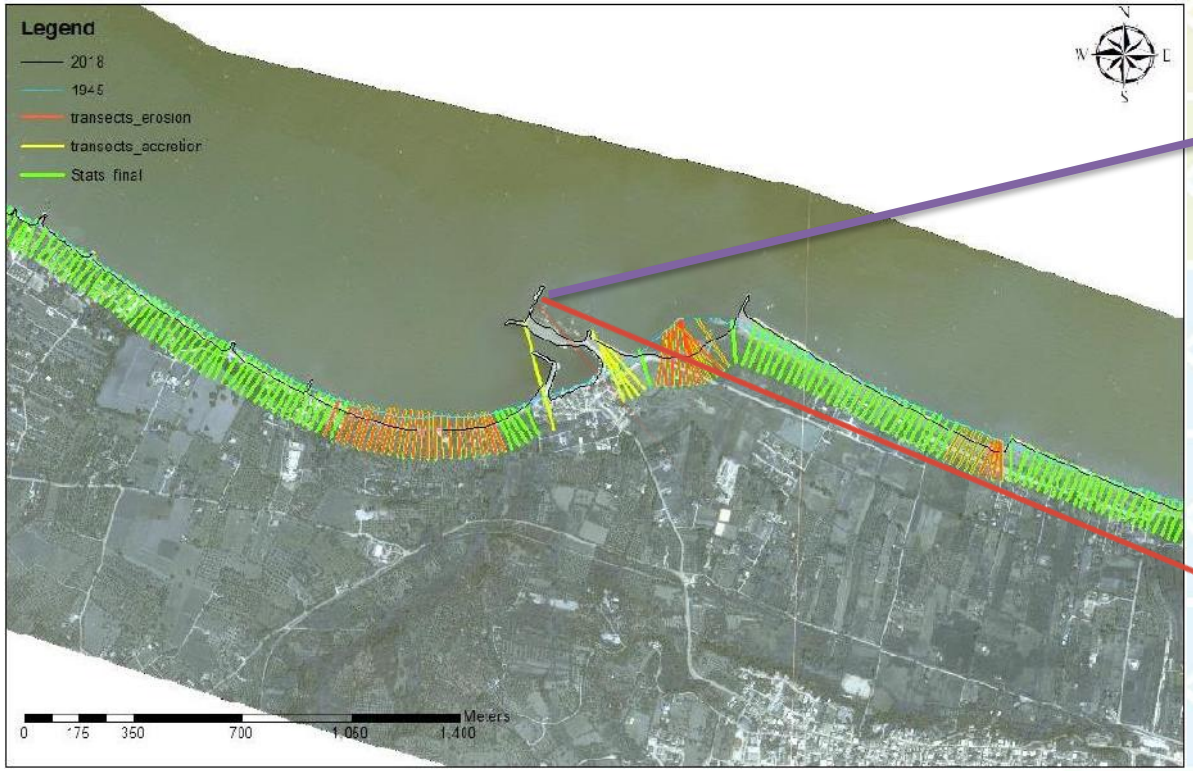
Site 2: Karnari beach

The specific area is a characteristic example of the complexity of the phenomenon. In the same area there is an alternation of intense erosion and deposition. **Intense erosion was found in the eastern part of the area, equal to shoreline displacement inland of 78.74 m and a rate of -1.07 m/year.**

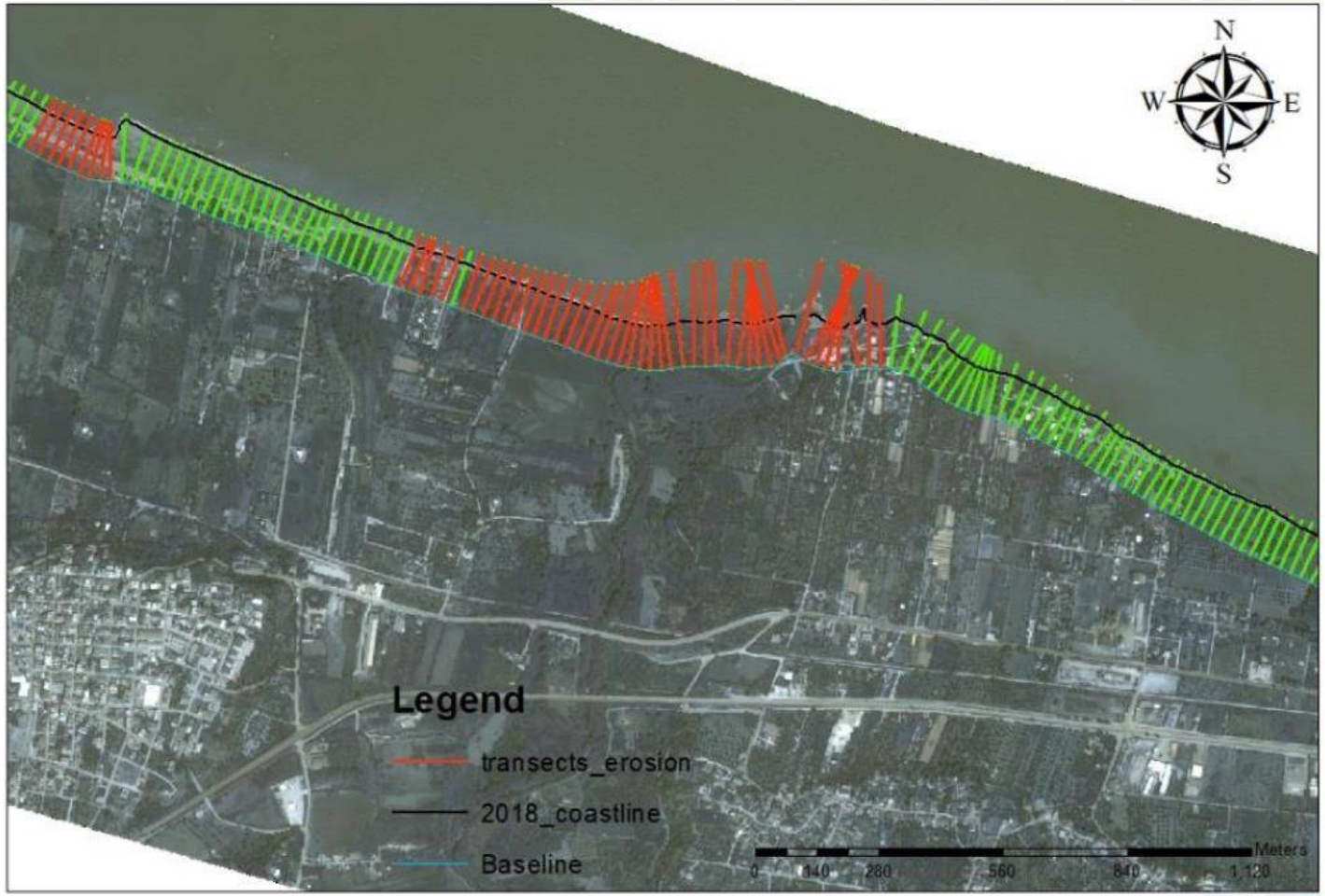
Sedimentation was located in the western part equal to 113 m and 1.56 m/year.



Site 3: Kalamaki beach
Inside the yellow box are the sea walls in front of a local resort



Site 4: Niforeika and Alykes beach

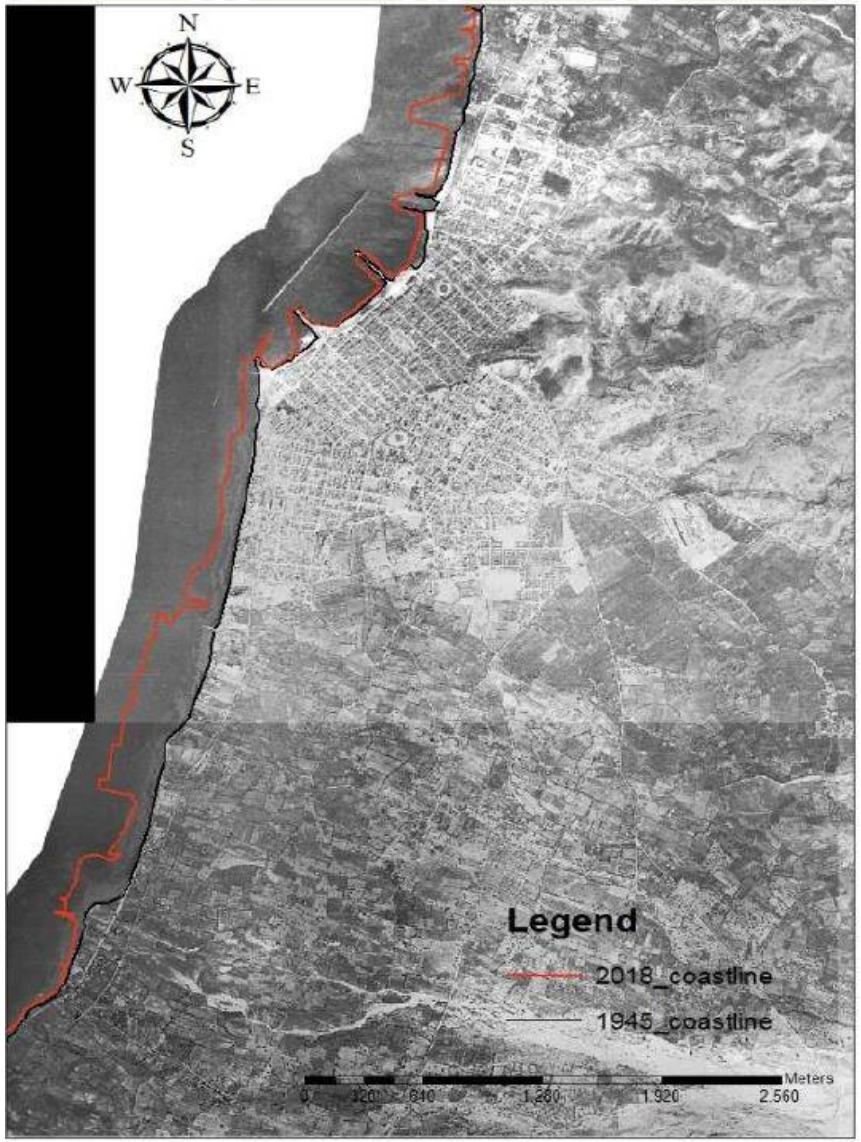


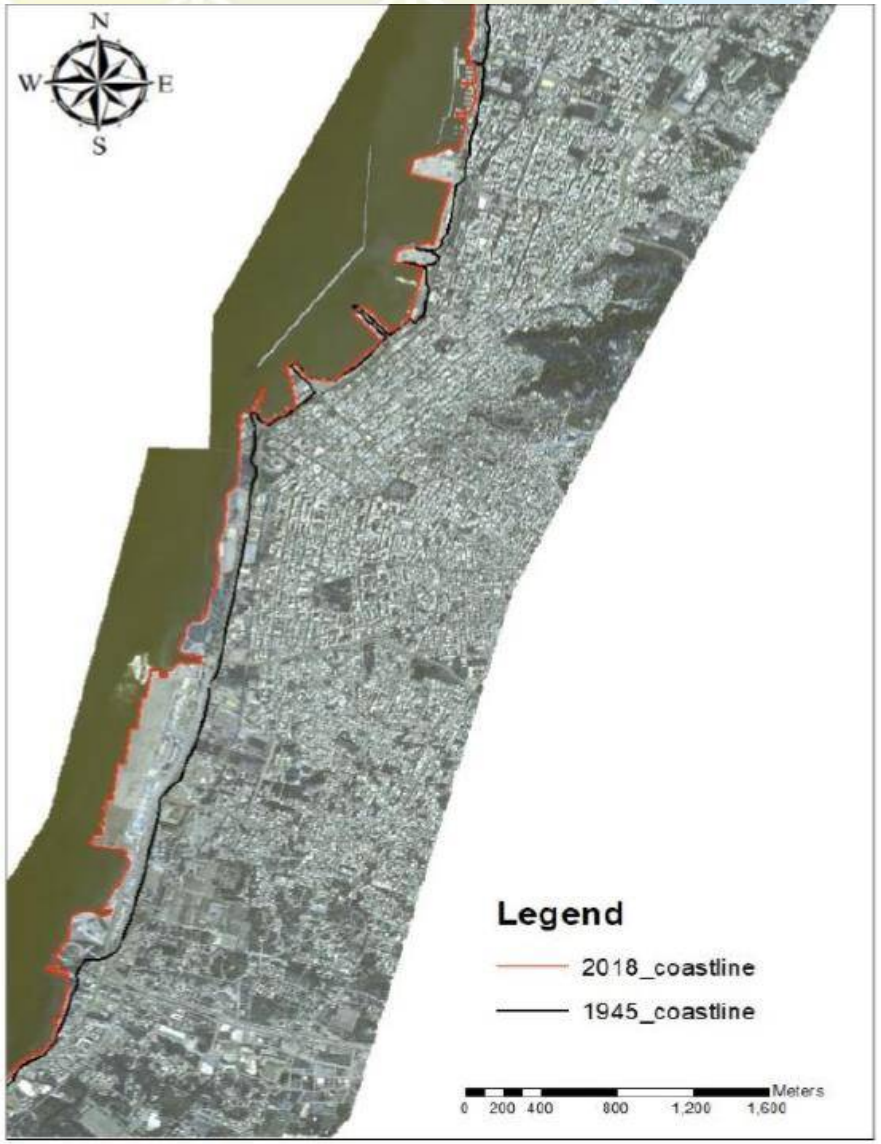
Site 5: Gialos beach

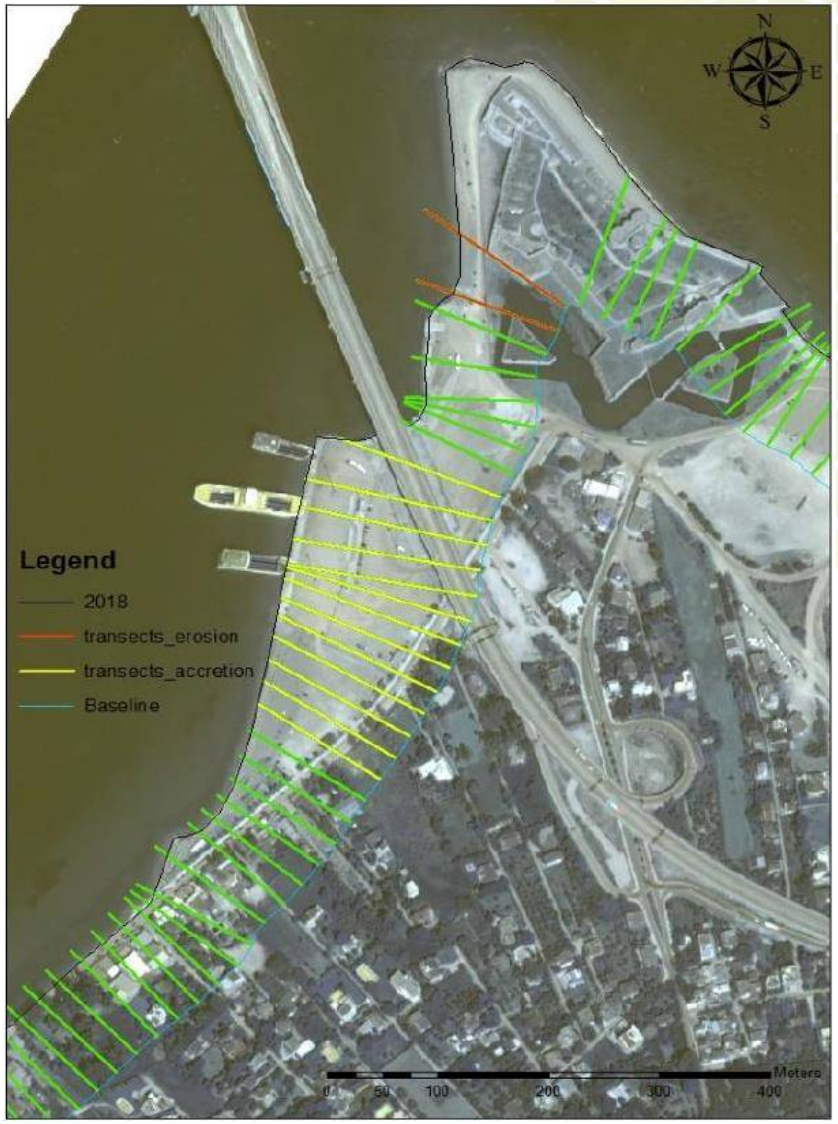
The mean erosion rate overpassed 1.15m/year and the coastline has retreated for almost 80m (average value) during the specific period. A dam was recently built in Peiros stream and so the erosion is expected to be higher in the forthcoming years.

Sites 6 and 7: The old and the new port of Patras. (Air photos of 1945 and 2018 on the left and on the right side respectively)

Due to the construction of the port facilities, an artificial increase of the land (more than 226m) and an accretion rate equal to 3.12m/year are observed.

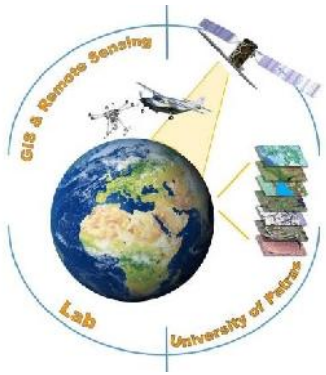






Site 8: Rio

There is an alternation of accretion and erosion at a rate of 0.15m / year. The construction of the pier leads to erosion further east due to the obstruction of the coastal currents.



Thank you for your attention !!!