Co-funded by the
Erasmus+ Programme
of the European Union

NatRisk

Development of master curricula for natural disasters risk management in Western Balkan countries

Monitoring of structures and territories using drones and remote surveys

Giovanni Randazzo

Teaching staff training and study visit
Messina, 19th -21st September 2017

Project number: 573806-EPP-1-2016-1-RS-EPPKA2-CBHE-JP

"This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein"

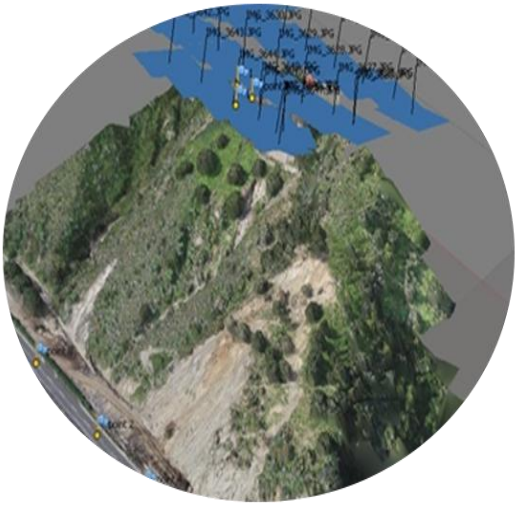
Once, when we were young, we survived without smartphones

Today it seems almost impossible to do that and the smartphone is like an umbilical cord or a leash; it depends …

Actually you can neither get married without drones

Laboratorio di Geomorfologia e Geologia Ambientale

Drone lab



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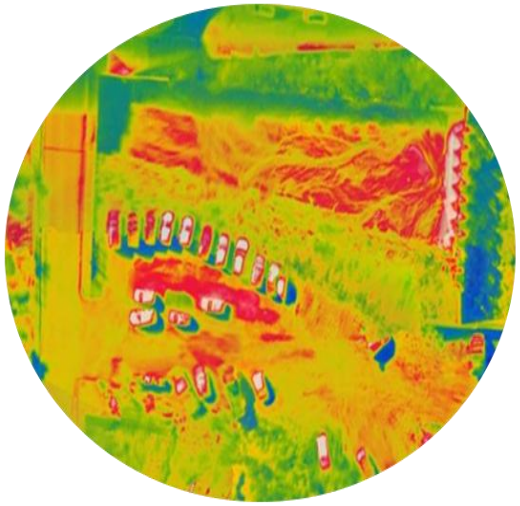
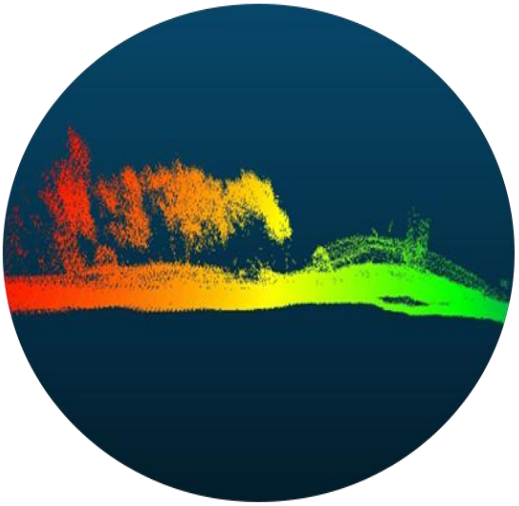


THERMOGRAPHIC

LIDAR – LASER SCANNER



MULTISPECTRAL

MIFT DIPARTIMENTO DI SCIENZE MATEMATICHE E INFORMATICHE SCIENZE FISICHE E SCIENZE DELLA TERRA

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Anmanned Underwater Veichle

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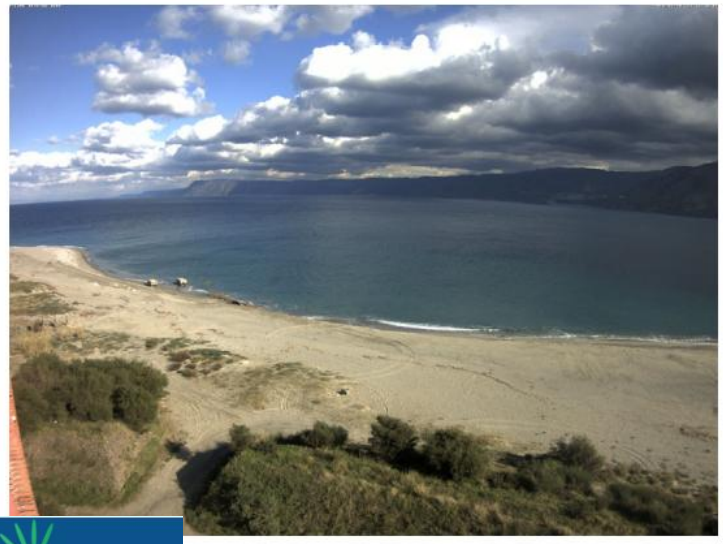
Video – monitoraggio dell'area di studio

Fotocamera Nord – Est

16/06/2015

17/01/2016



20/01/2016

14/06/2016

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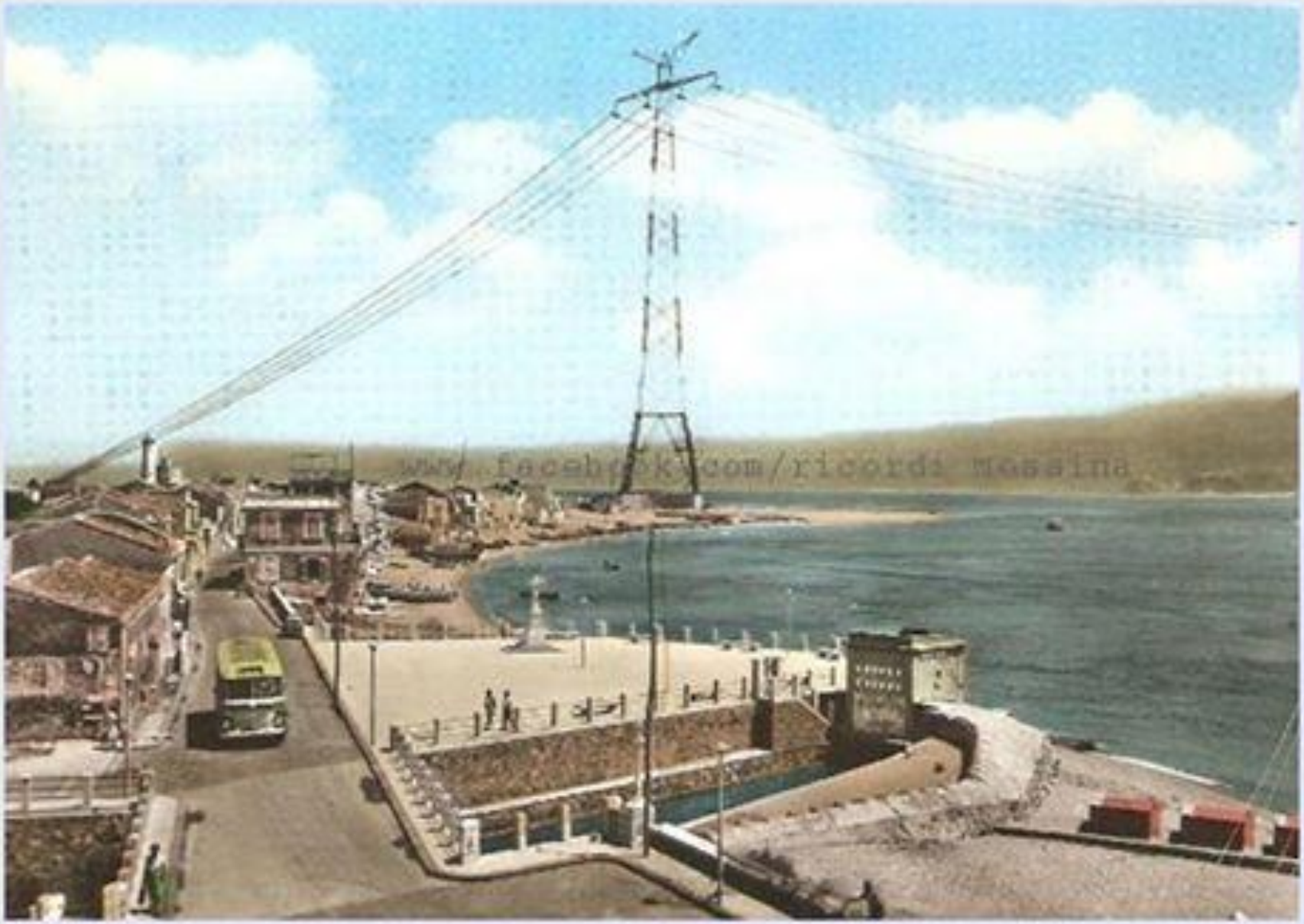
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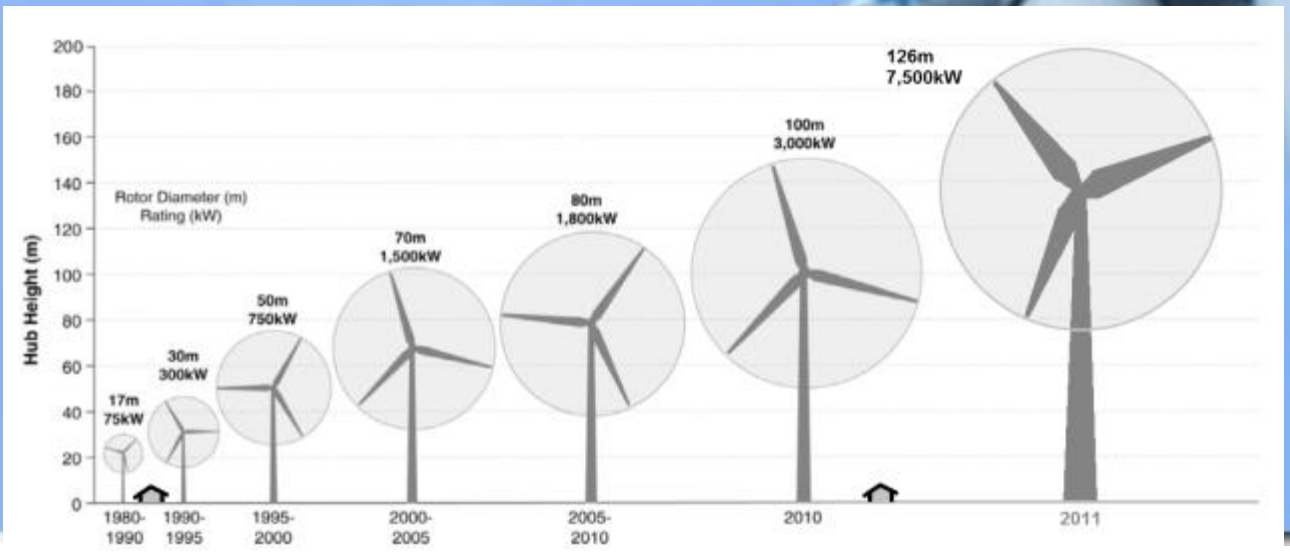
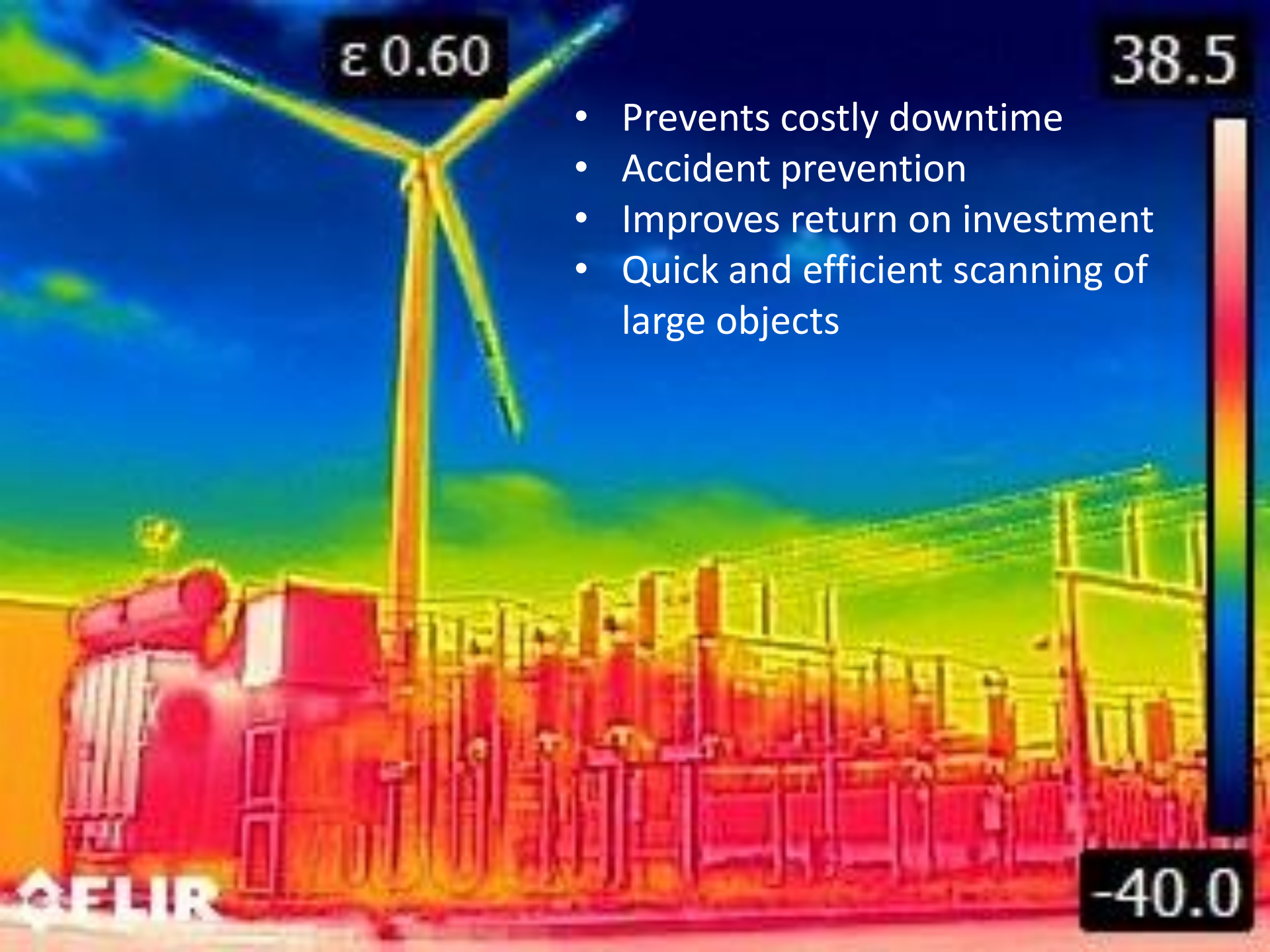
WIND ENERGY

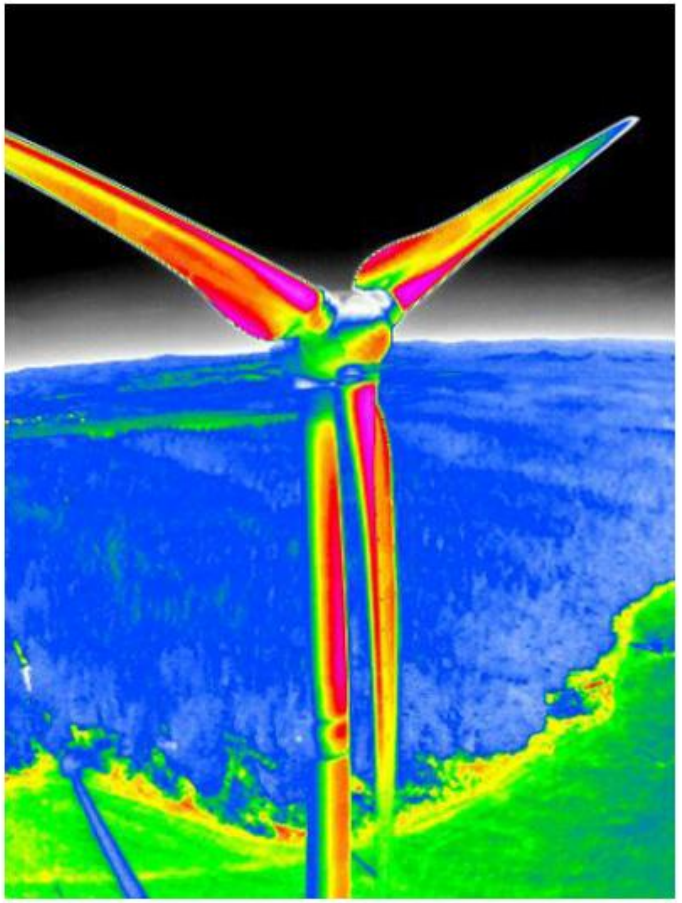

SIEMENS


Hub Height (m)
200
180
160
140
120
100
80
60
40
20
0
Rotor Diameter (m)
Rating (kW)
17m
75kW
30m
300kW
50m
750kW
70m
1,500kW
80m
1,800kW
100m
3,000kW
126m
7,500kW
1980-
1990
1990-
1995
1995-
2000
2000-
2005
2005-
2010
2010
2011



- Prevents costly downtime
- Accident prevention
- Improves return on investment
- Quick and efficient scanning of large objects

- Allows you to repair or replace components before failure occurs
- Detects exactly which component is causing the problem
- Direct contact with the objects is not required



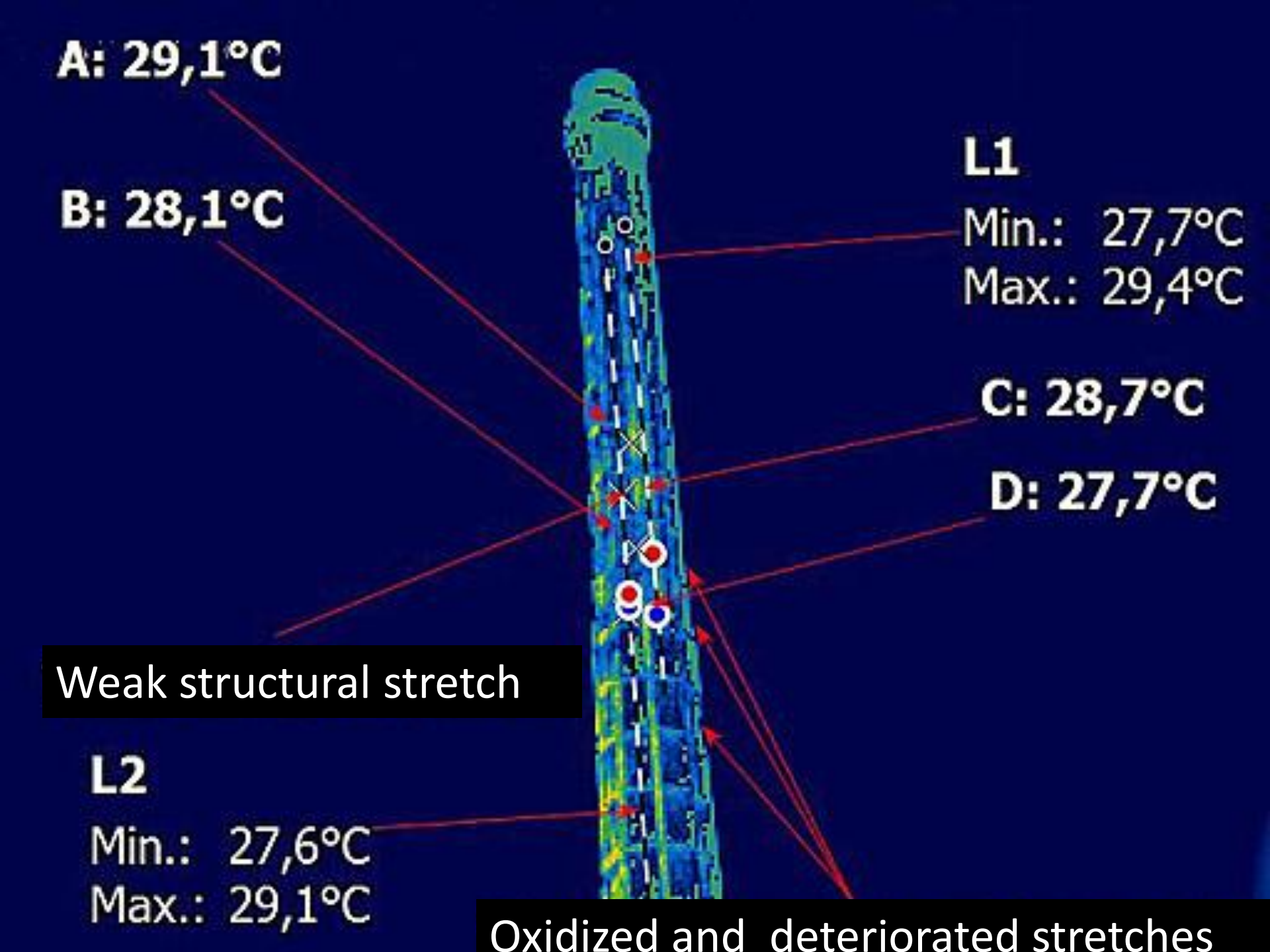

Incident Tracking
Worksite Inspections
Incident Risk Assessment
Safety Management
Action Item Tracking
Employee Training
Employee Qualification

HPS

High Performance Structures

Chimney

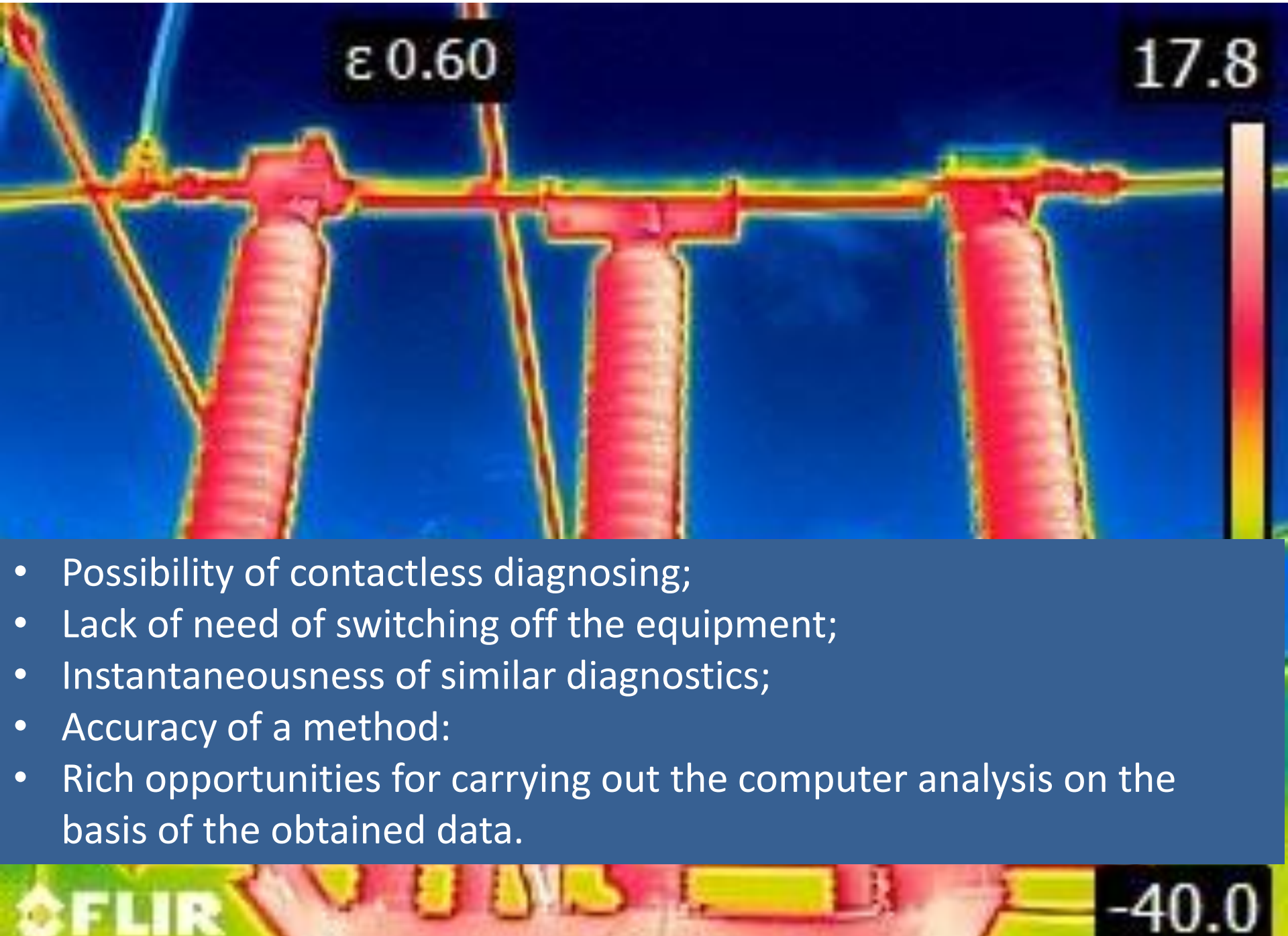
Rising of High-Rise Structures


A: 29,1°C
B: 28,1°C
L1
Min.: 27,7°C
Max.: 29,4°C
C: 28,7°C
D: 27,7°C
Weak structural stretch
L2
Min.: 27,6°C
Max.: 29,1°C
Oxidized and deteriorated stretches


MULTI STORY BUILDING

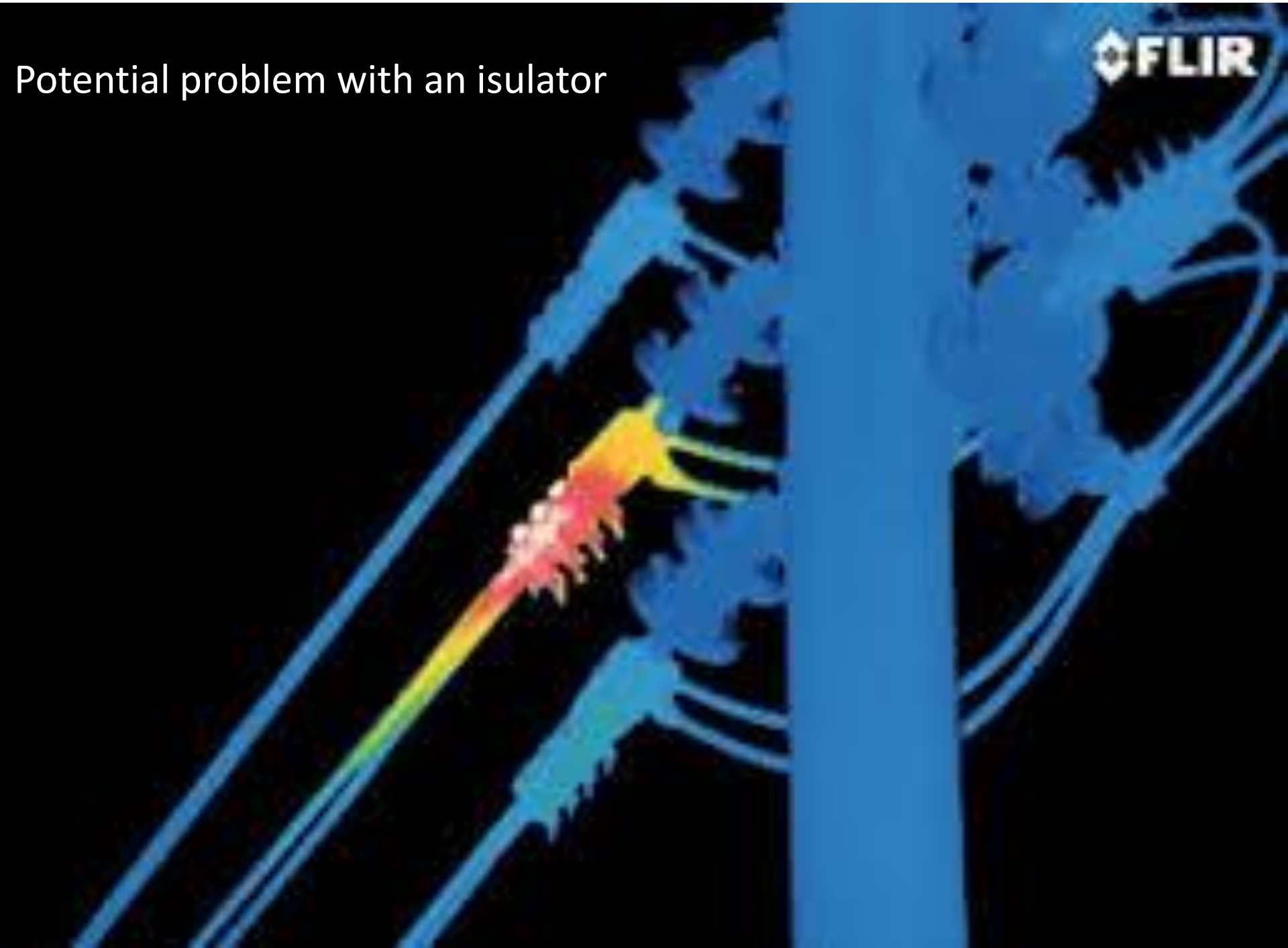
MULTI STORY BUILDING

OVEREHEAD POWER LINES



- Possibility of contactless diagnosing;
- Lack of need of switching off the equipment;
- Instantaneousness of similar diagnostics;
- Accuracy of a method:
- Rich opportunities for carrying out the computer analysis on the basis of the obtained data.

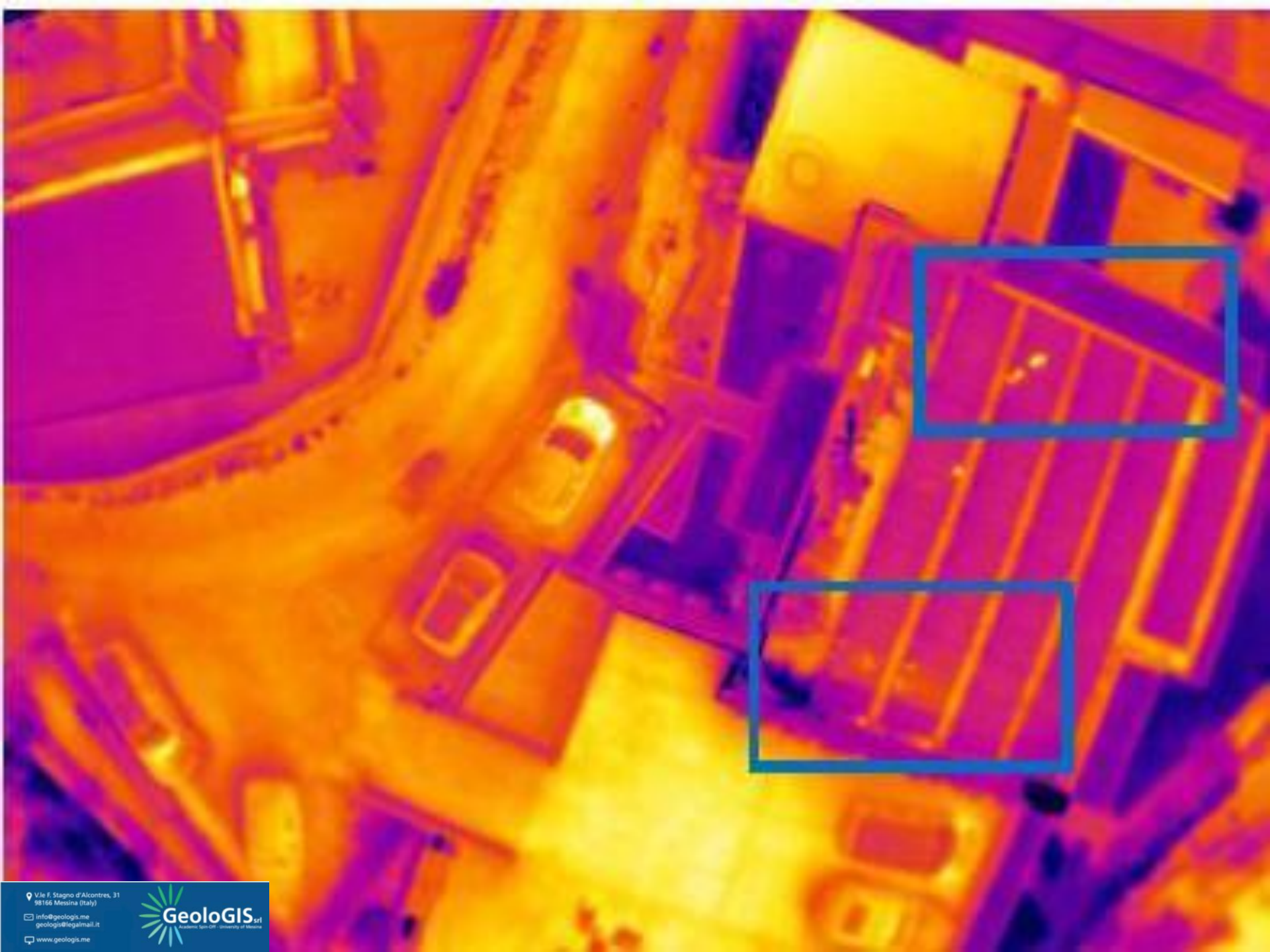
Potential problem with an isulator



CHINESE WAY

Fire shooting

SOLAR PHOTOVOLTAIC SYSTEM



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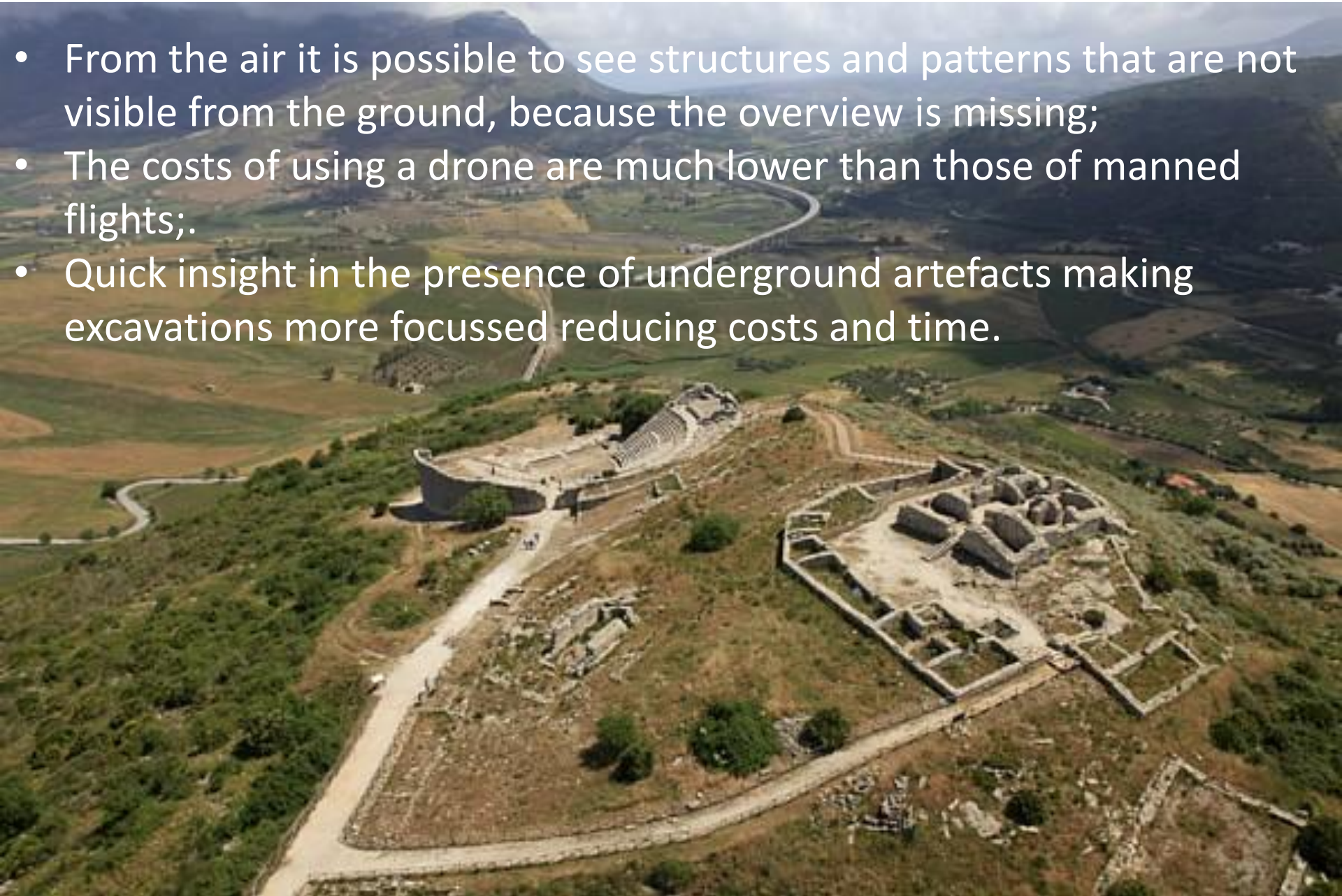
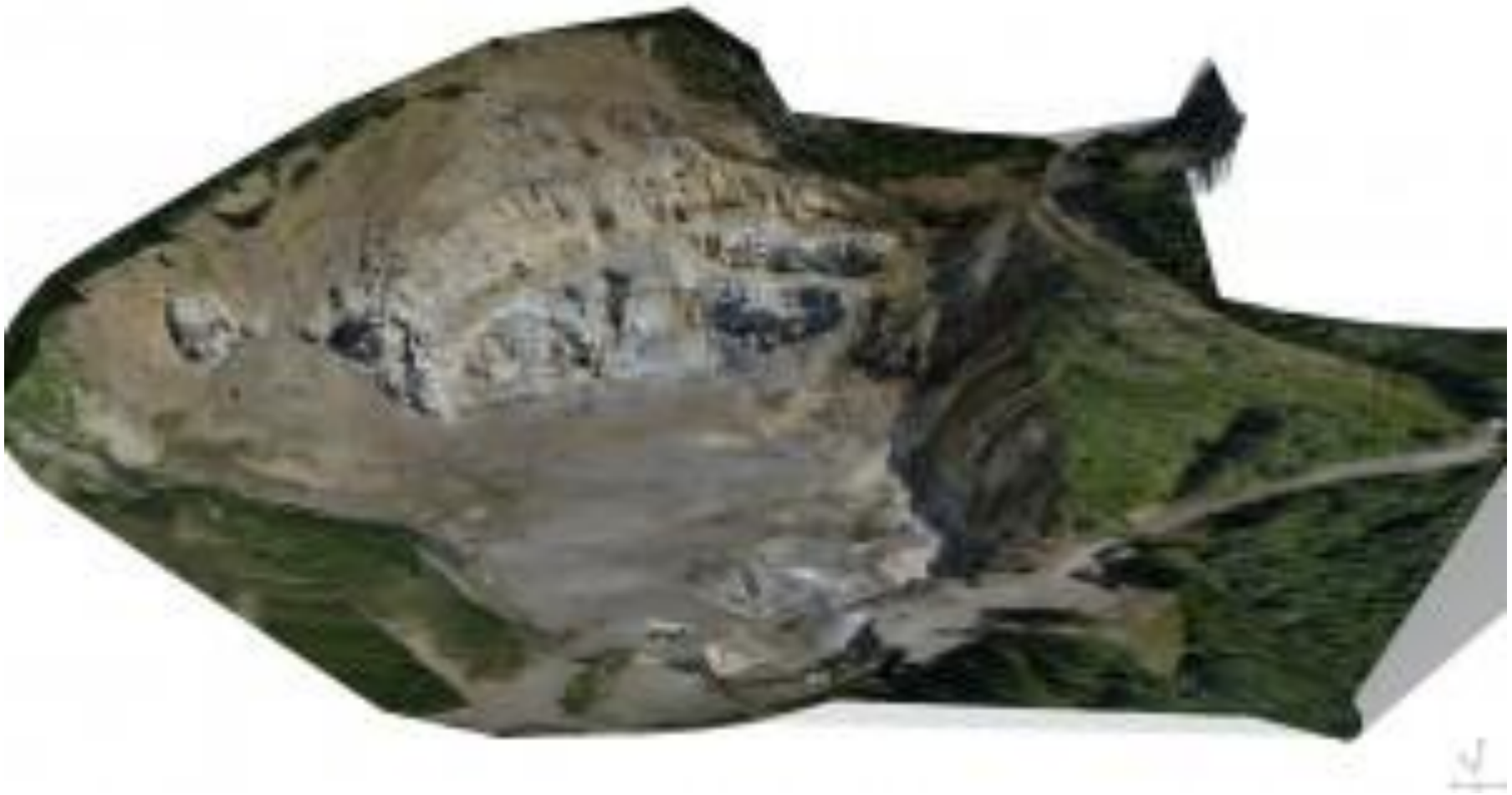
ARCHAEOLOGICAL DRONE RESEARCH



- From the air it is possible to see structures and patterns that are not visible from the ground, because the overview is missing;
- The costs of using a drone are much lower than those of manned flights;.
- Quick insight in the presence of underground artefacts making excavations more focussed reducing costs and time.

Perfect reconstruction of structures

… also to reconstruct open cut mining

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2.4GHz
T-FHSS
AIR
CHANNEL
TRANSMITTER


SEASTICK


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PRODUCTS

- Orthophoto

This below is the composition of 151 frames

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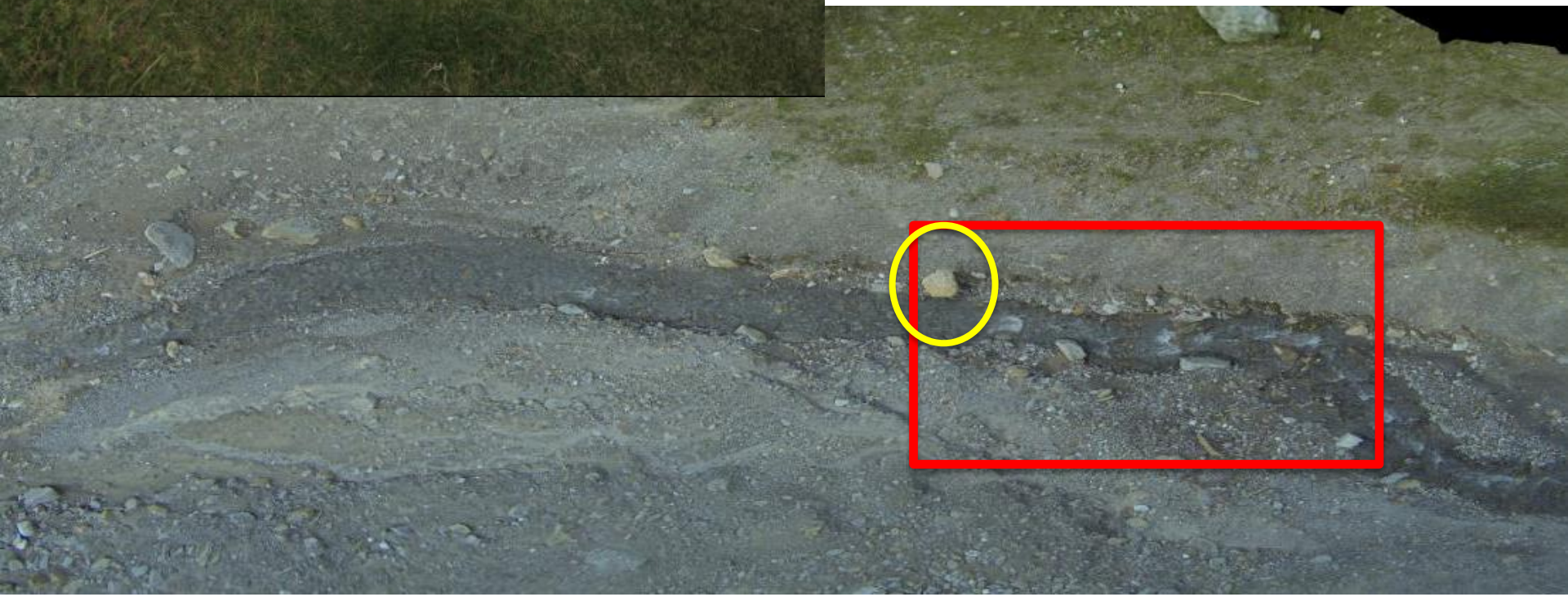
Fixed wing drone



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PRODUCTS

- Orthophoto

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PRODUCTS

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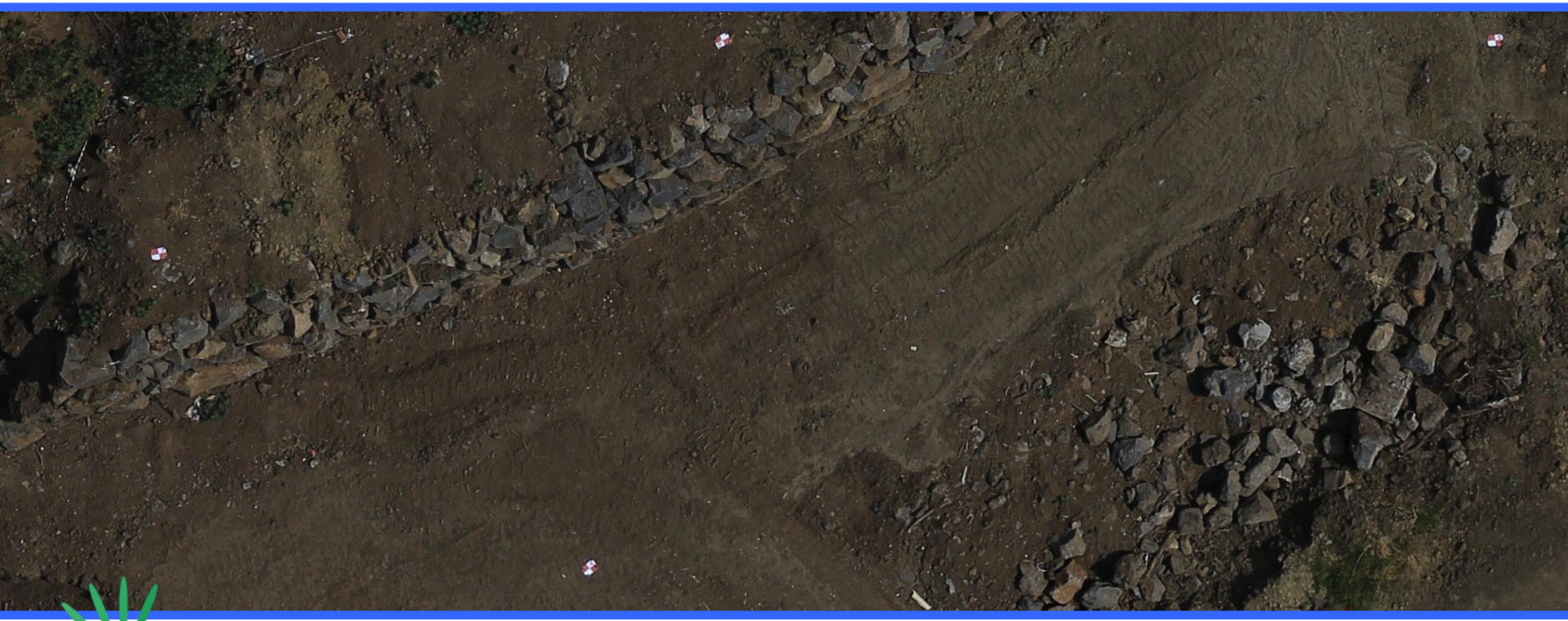
PRODUCTS

- Orthophoto



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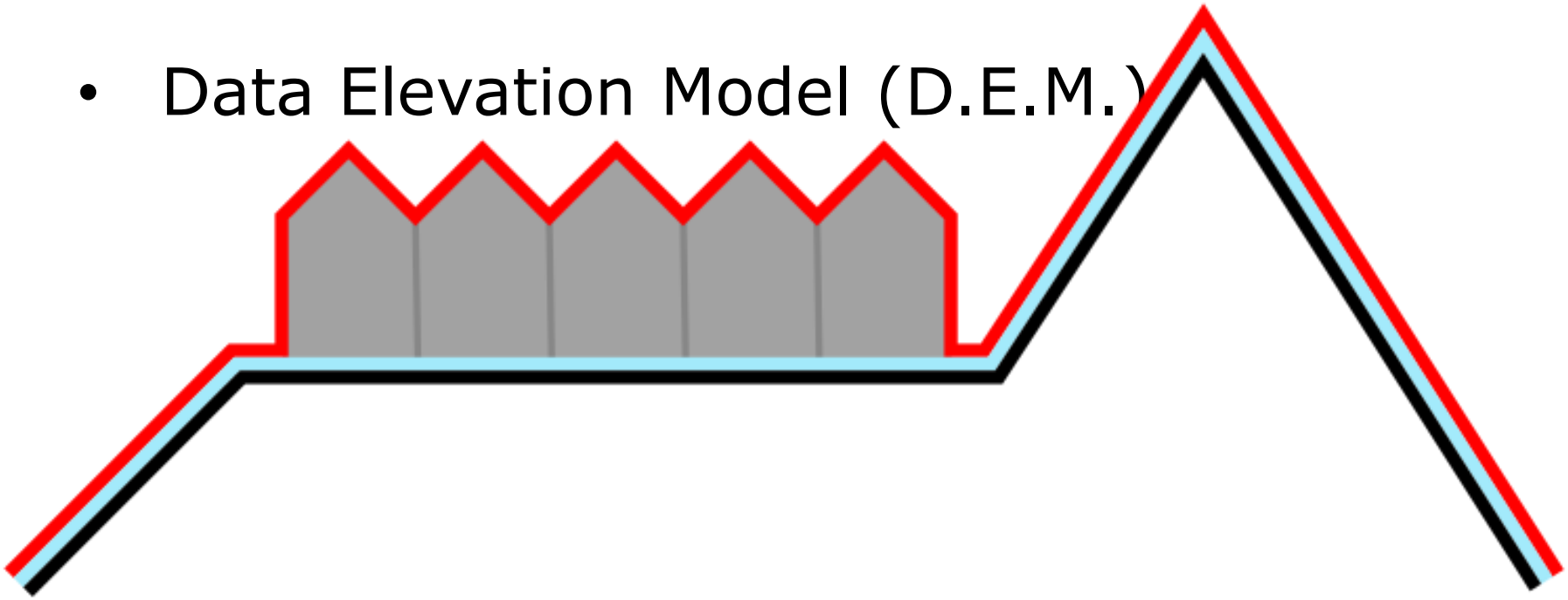
PRODOTTI

- Data Elevation Model (D.E.M.)



	Digital Surface Model
	Digital Terrain Model

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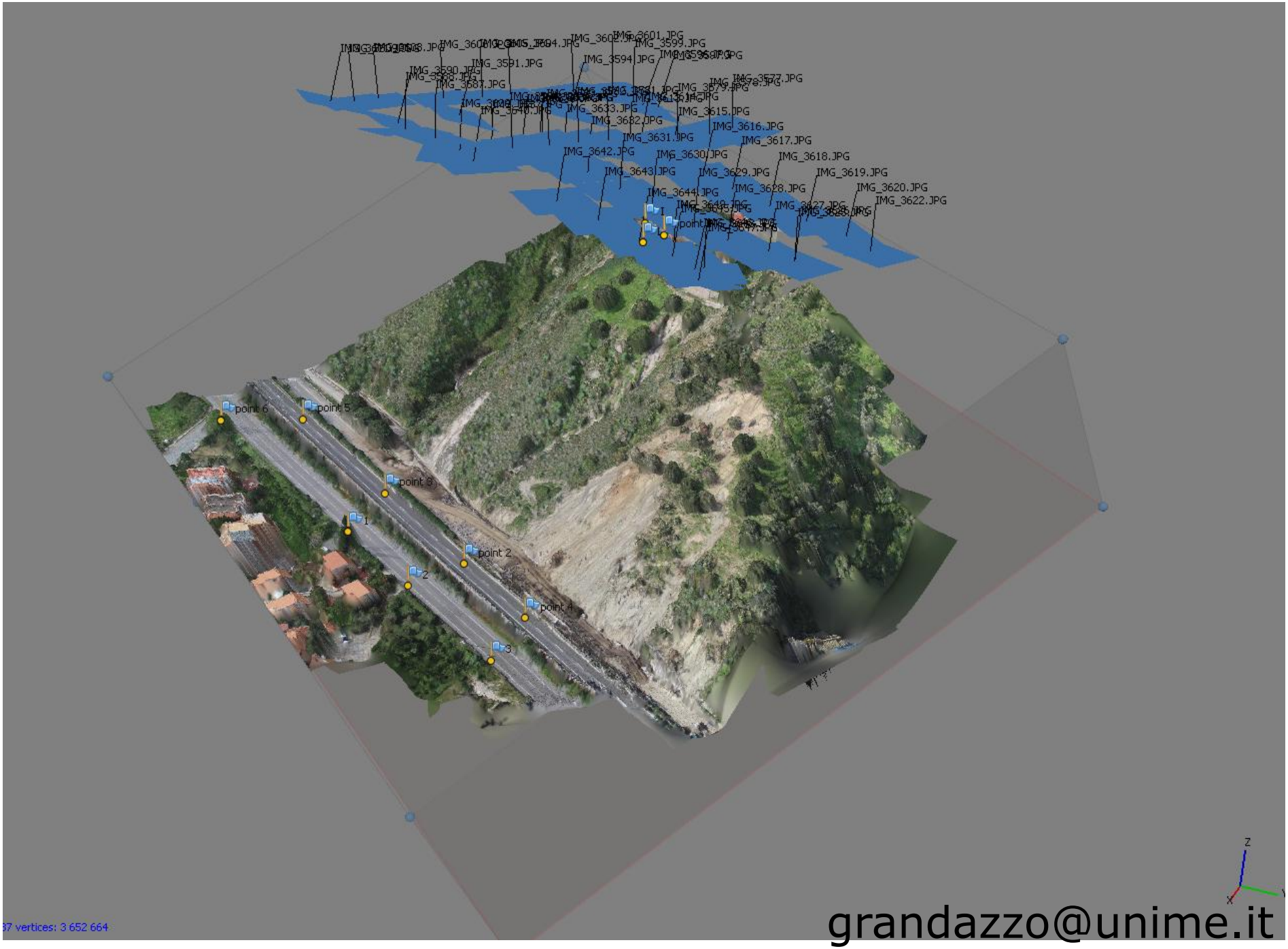

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Quota di volo 100 metri

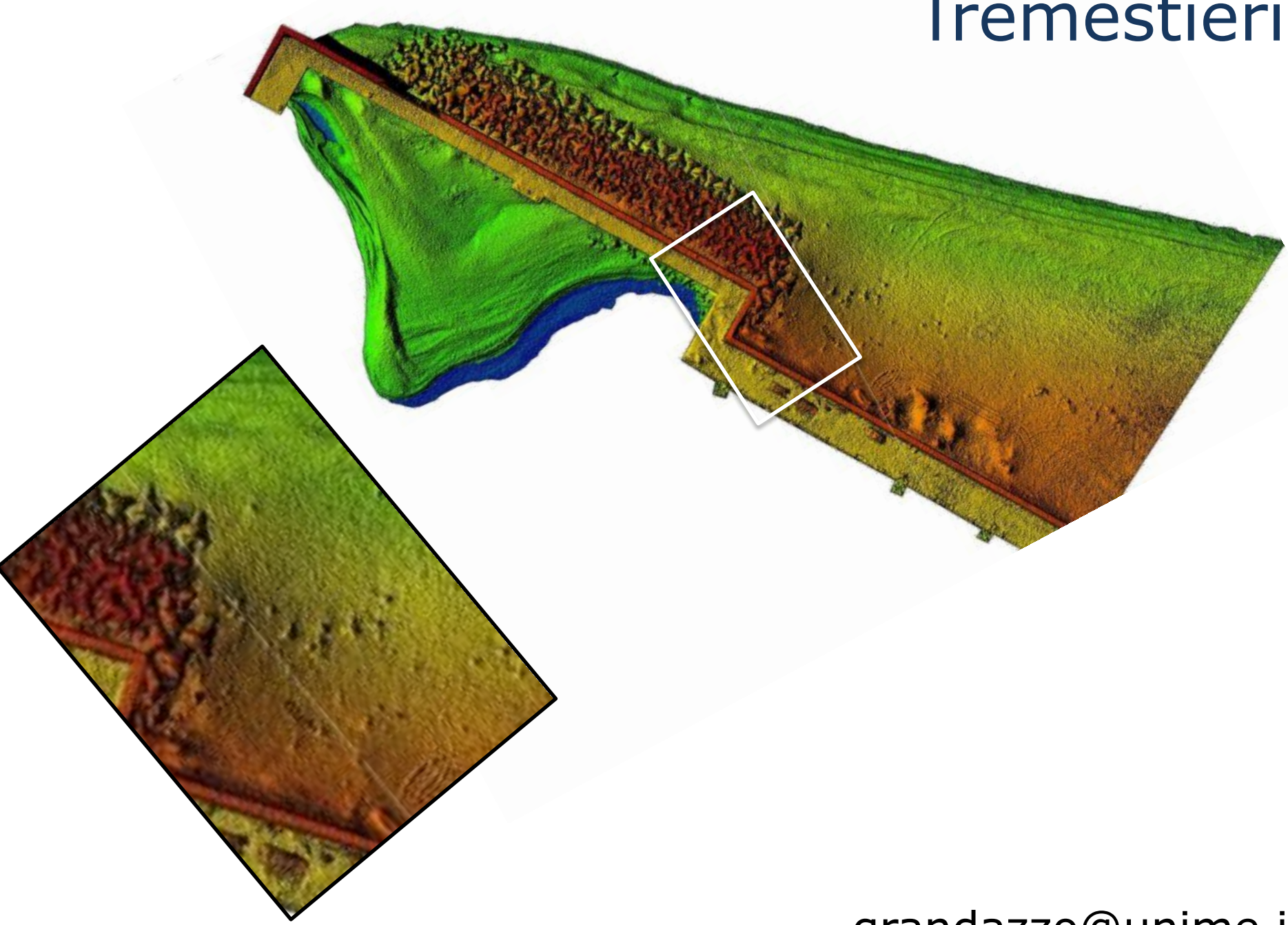
grandazzo@unime.it

granduzzo@unime.it

grandazzo@unime.it

grandazzo@unime.it

Tremestieri



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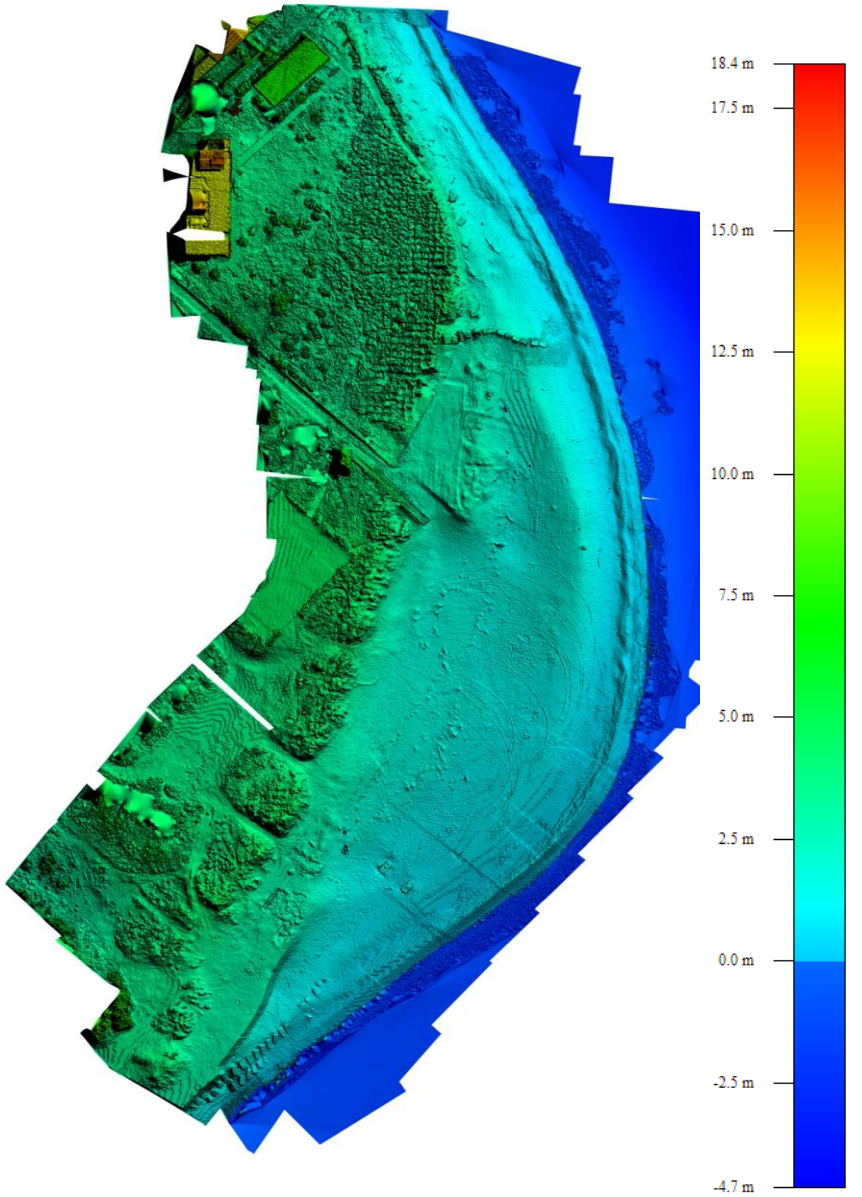
Ortofoto e **DEM** dell'area di studio dalla Torre degli inglesi al pilone

Risoluzione di 3cm/px



Risoluzione 0.25 x 0.25

PRODOTTI

- Data Terrain Model

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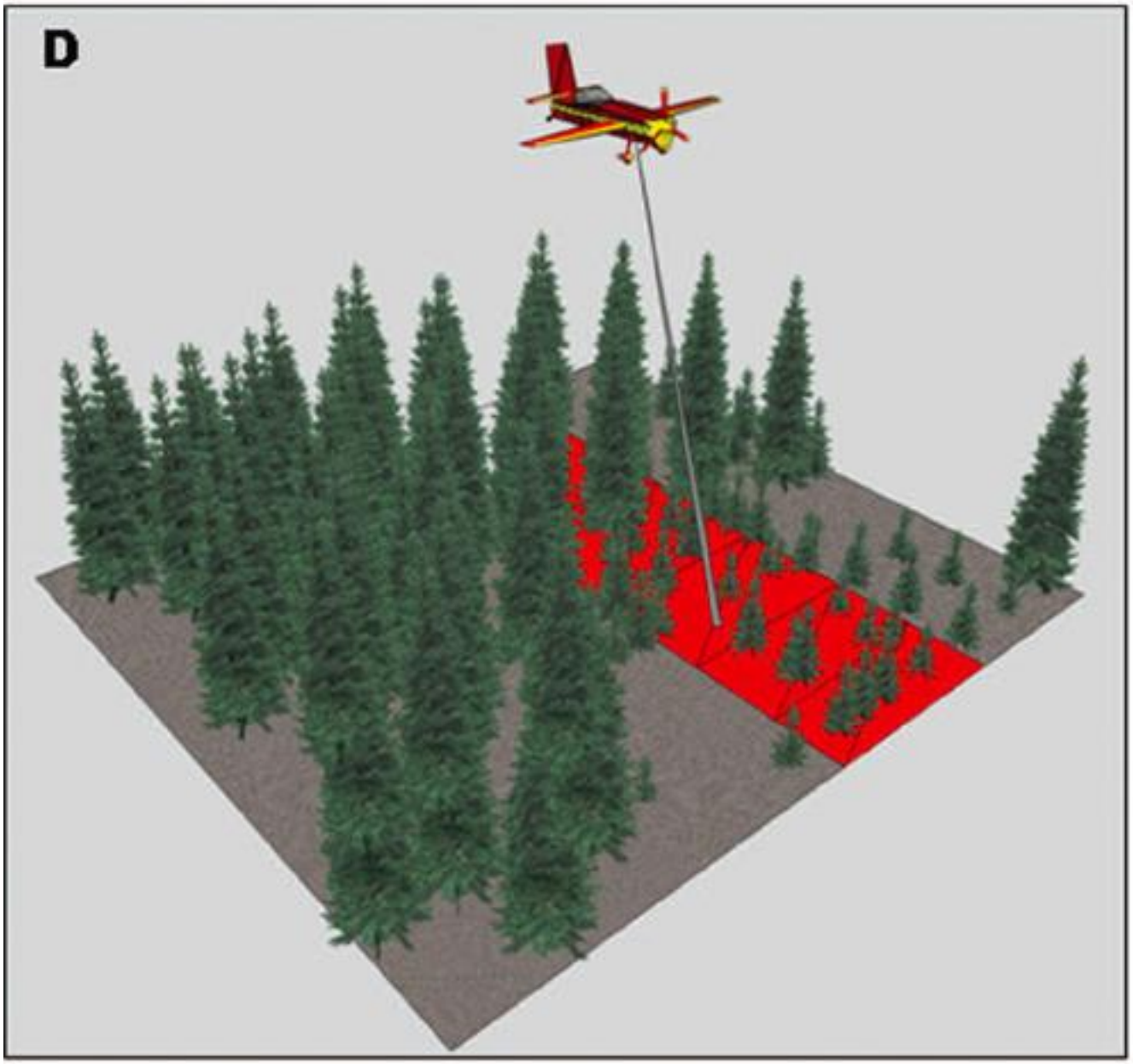

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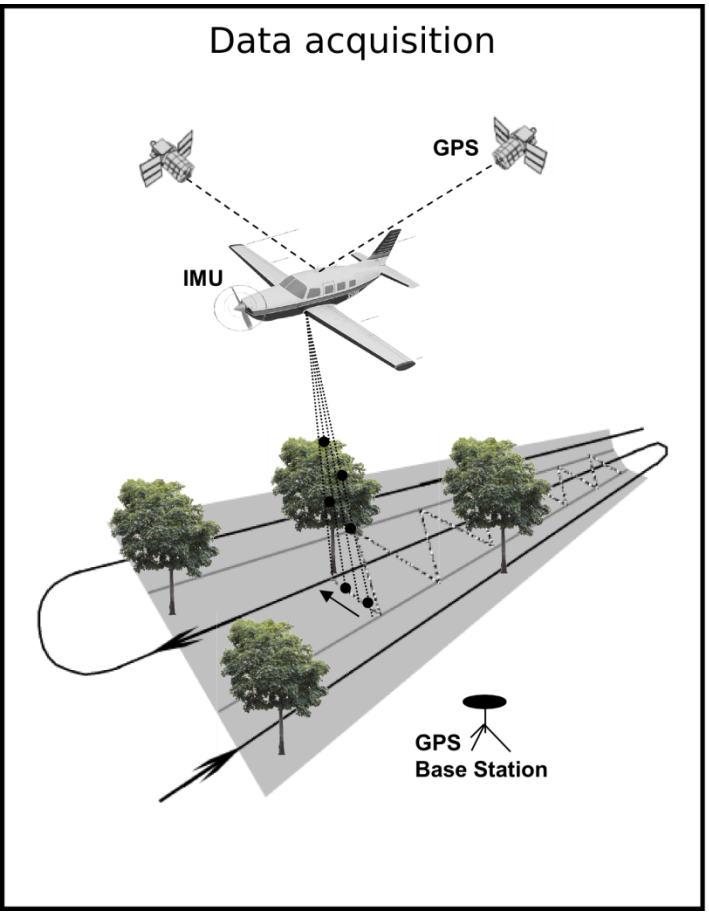

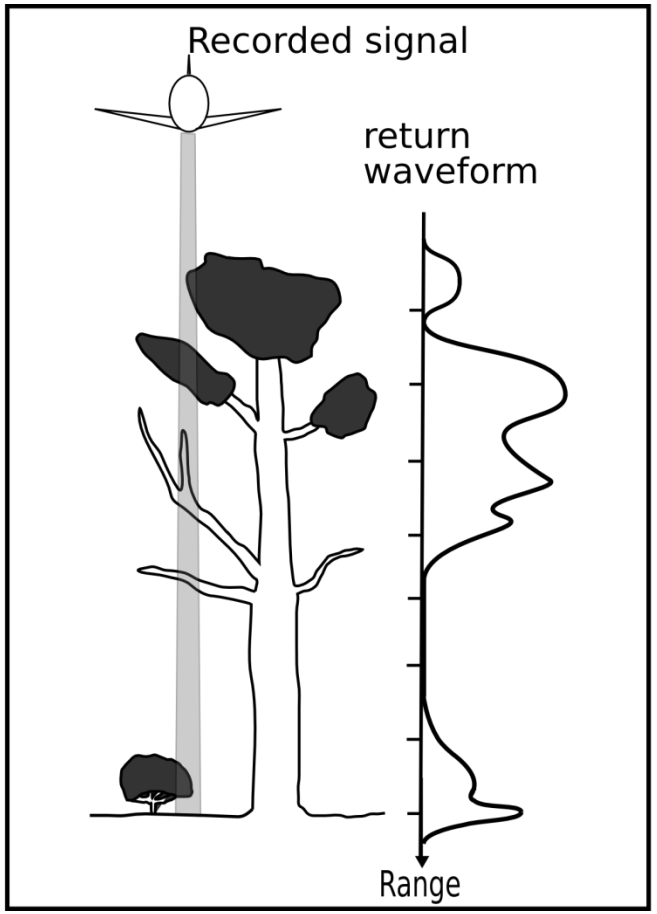

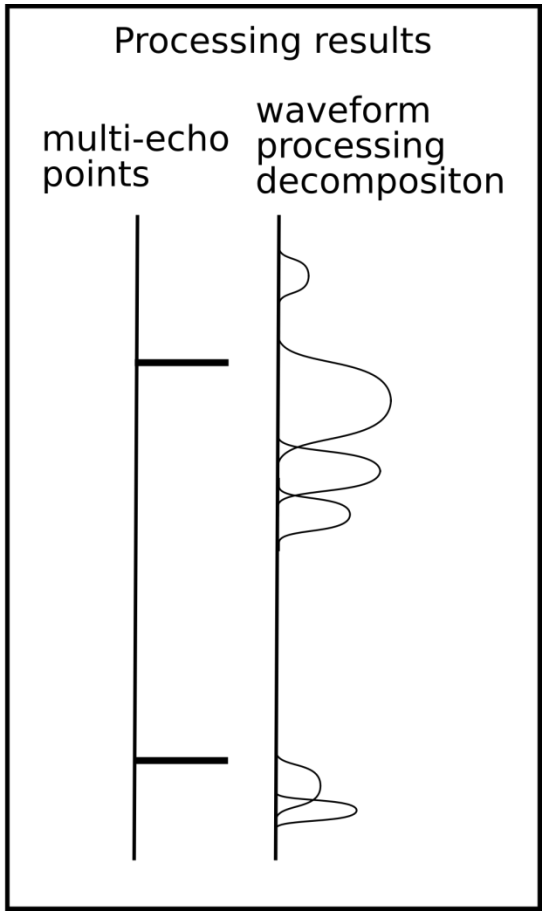

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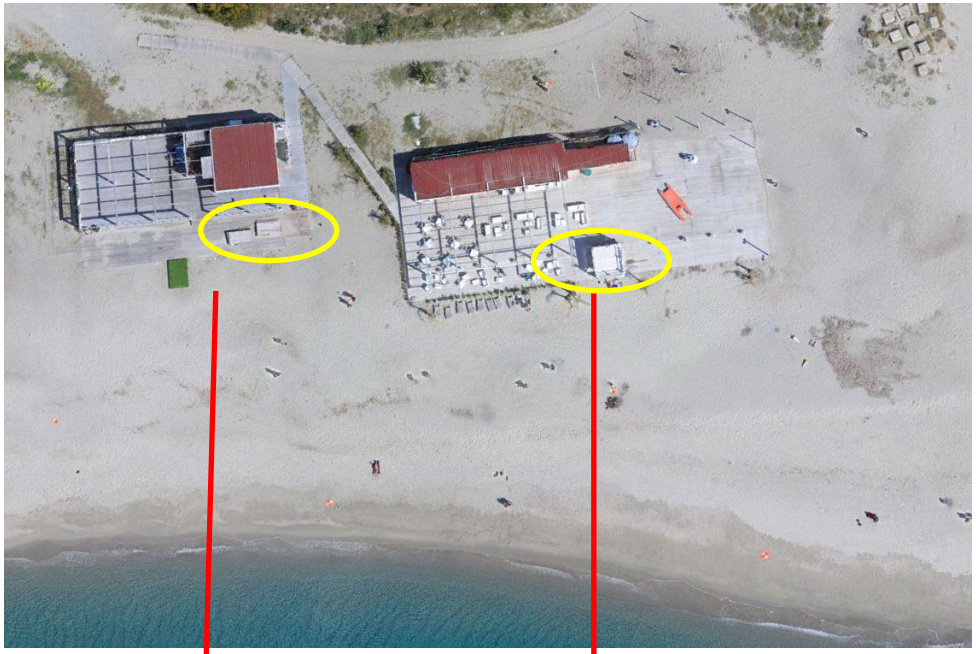
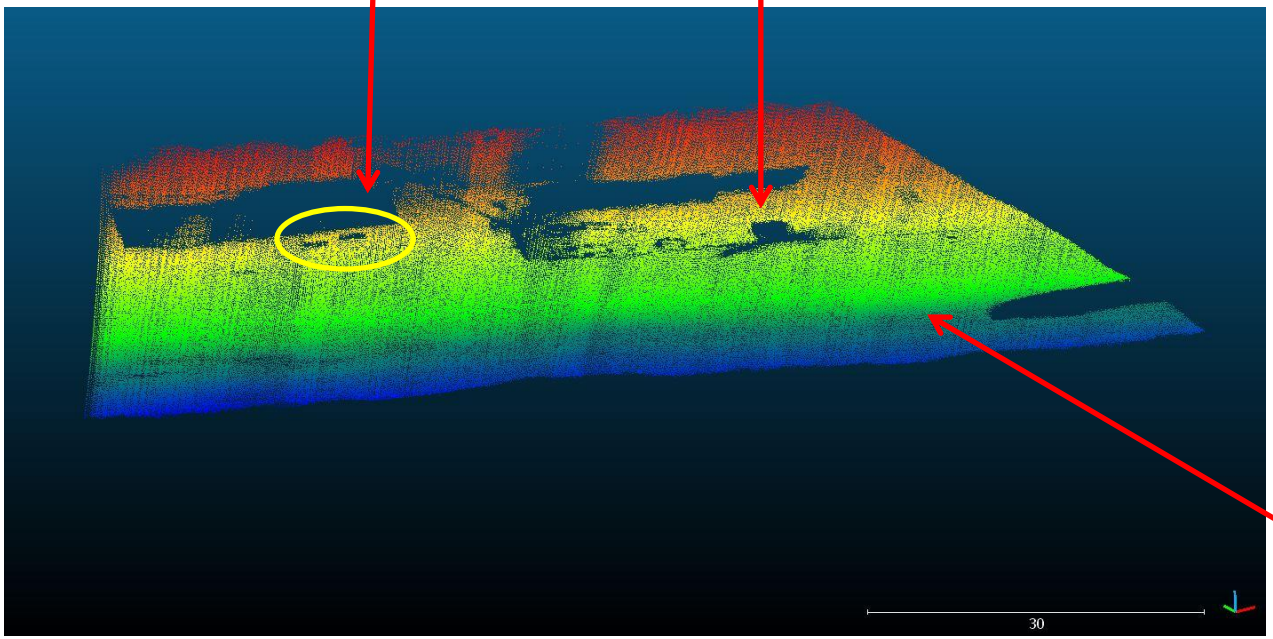


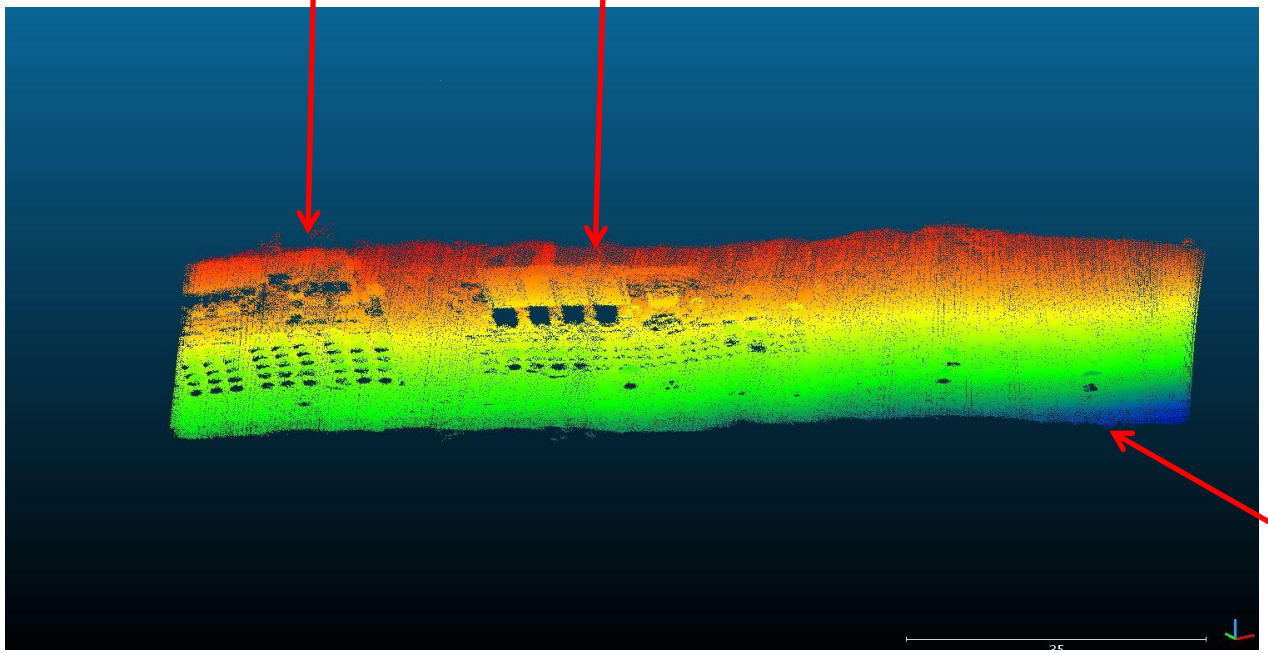
Point cloud



Linea di costa

Giugno 2017

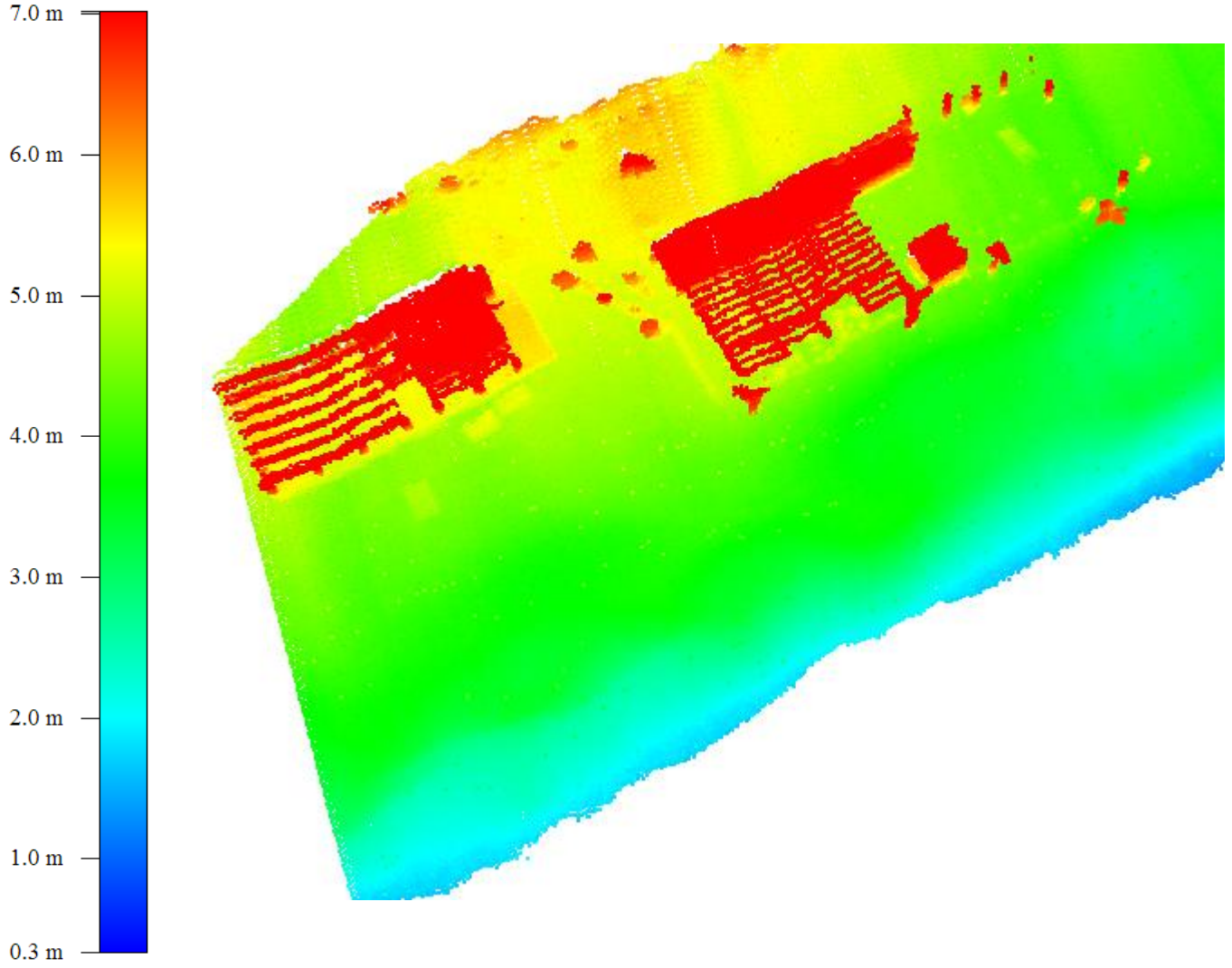
Nuvola punti



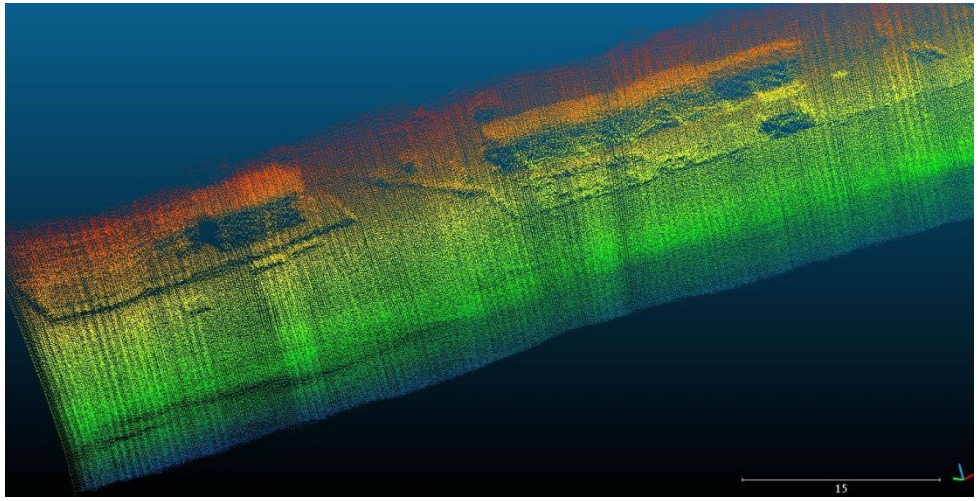
Linea di costa

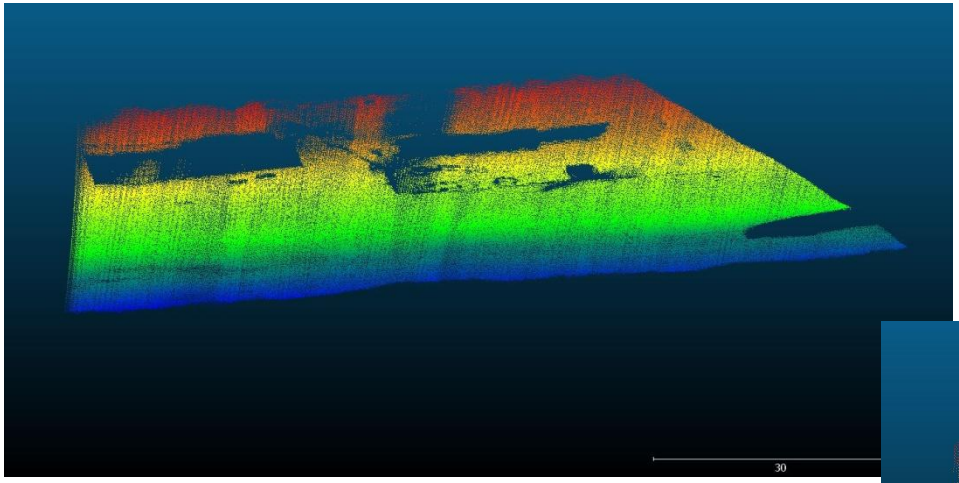
Febbraio 2017

Software Global Mapper



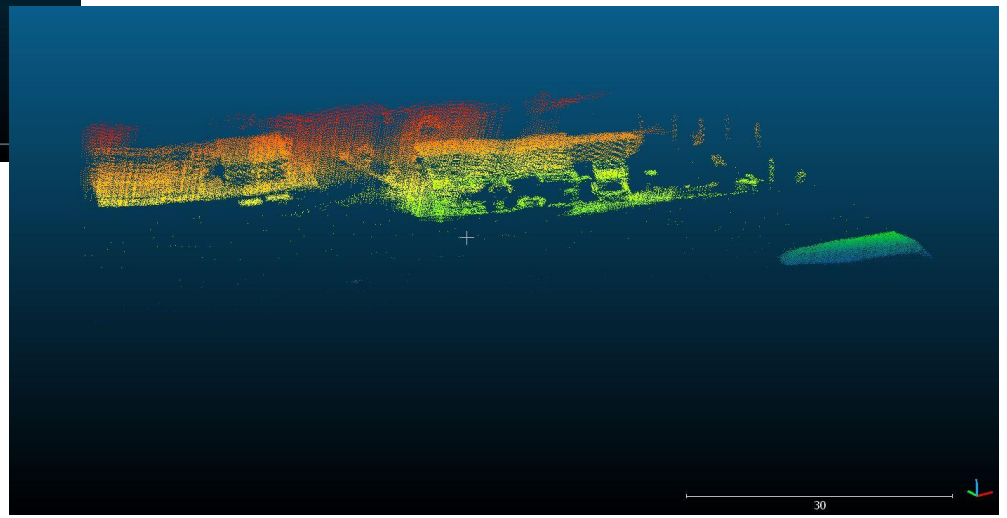
Febbraio 2017





Nuvola terreno

Nuvola antropico e vegetazione



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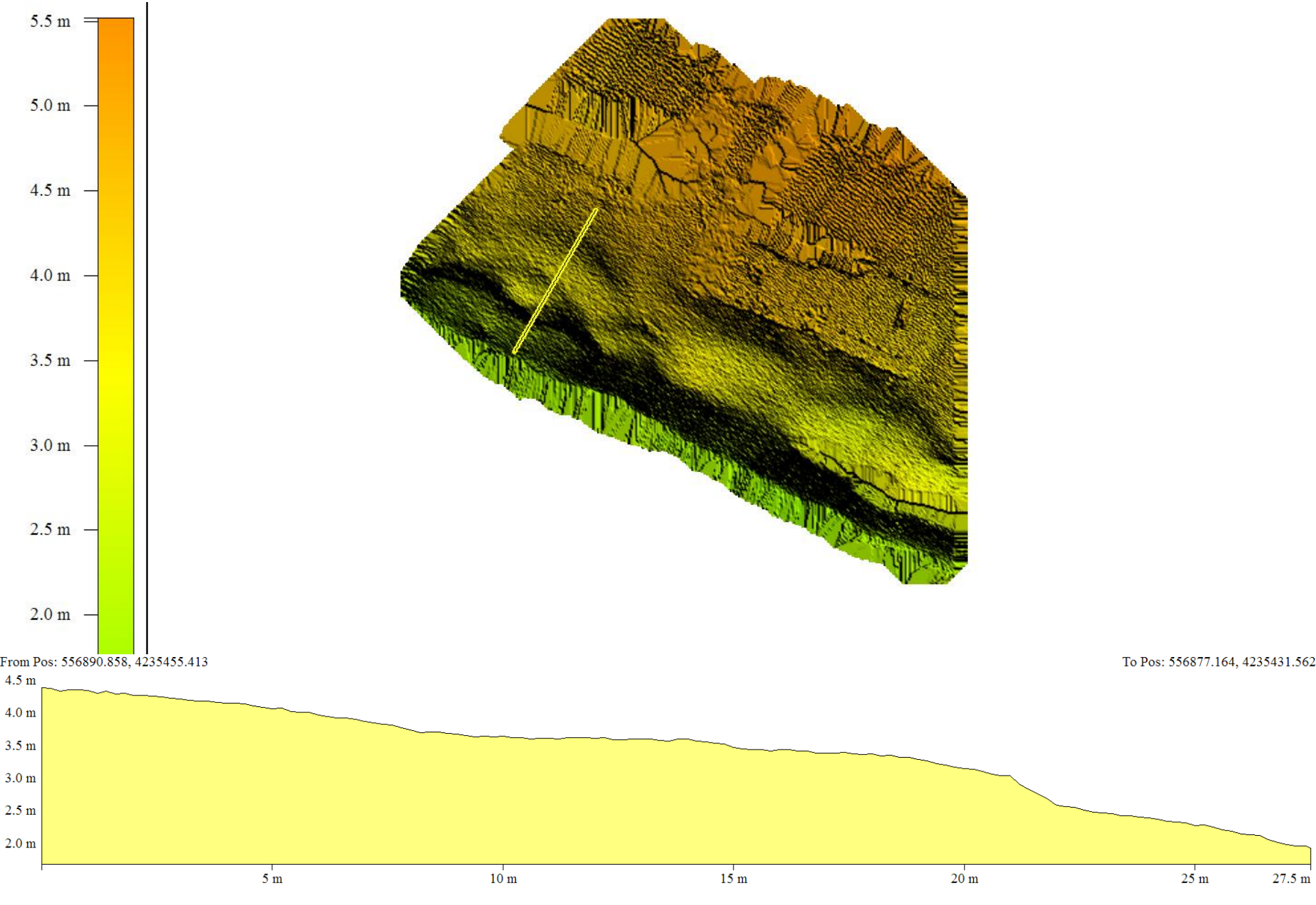

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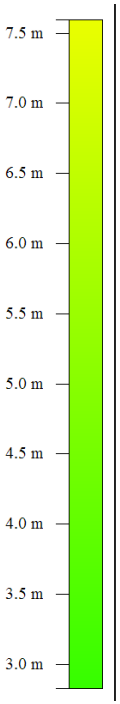
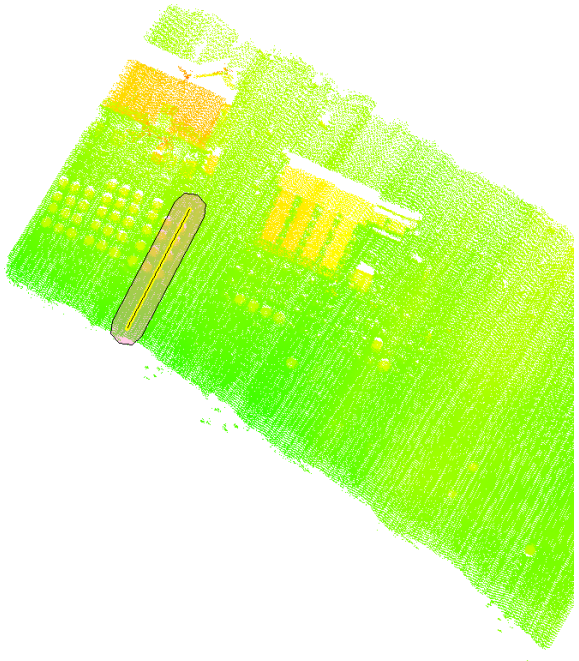
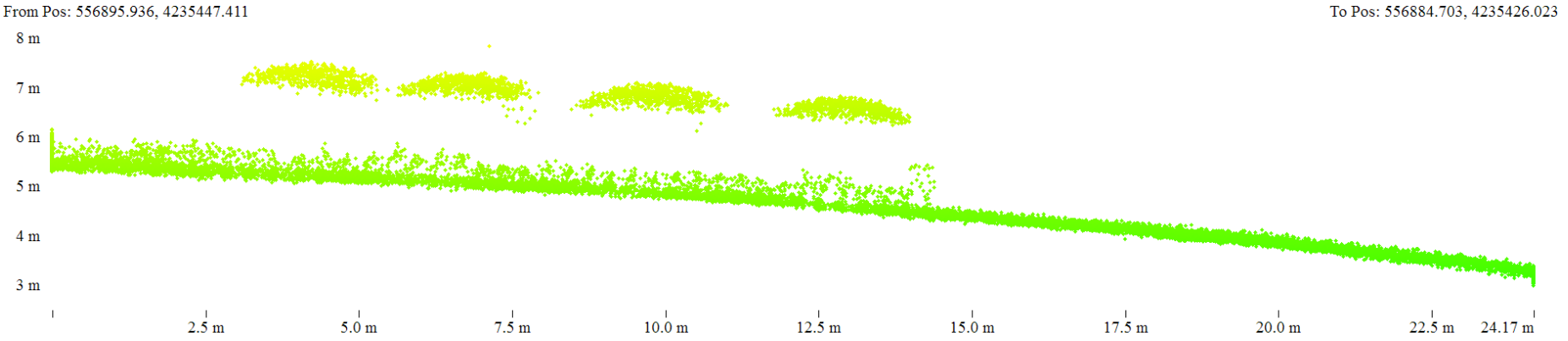




Software Global Mapper (scala grafica in base alle elevazioni)



- THERMOCAMERA

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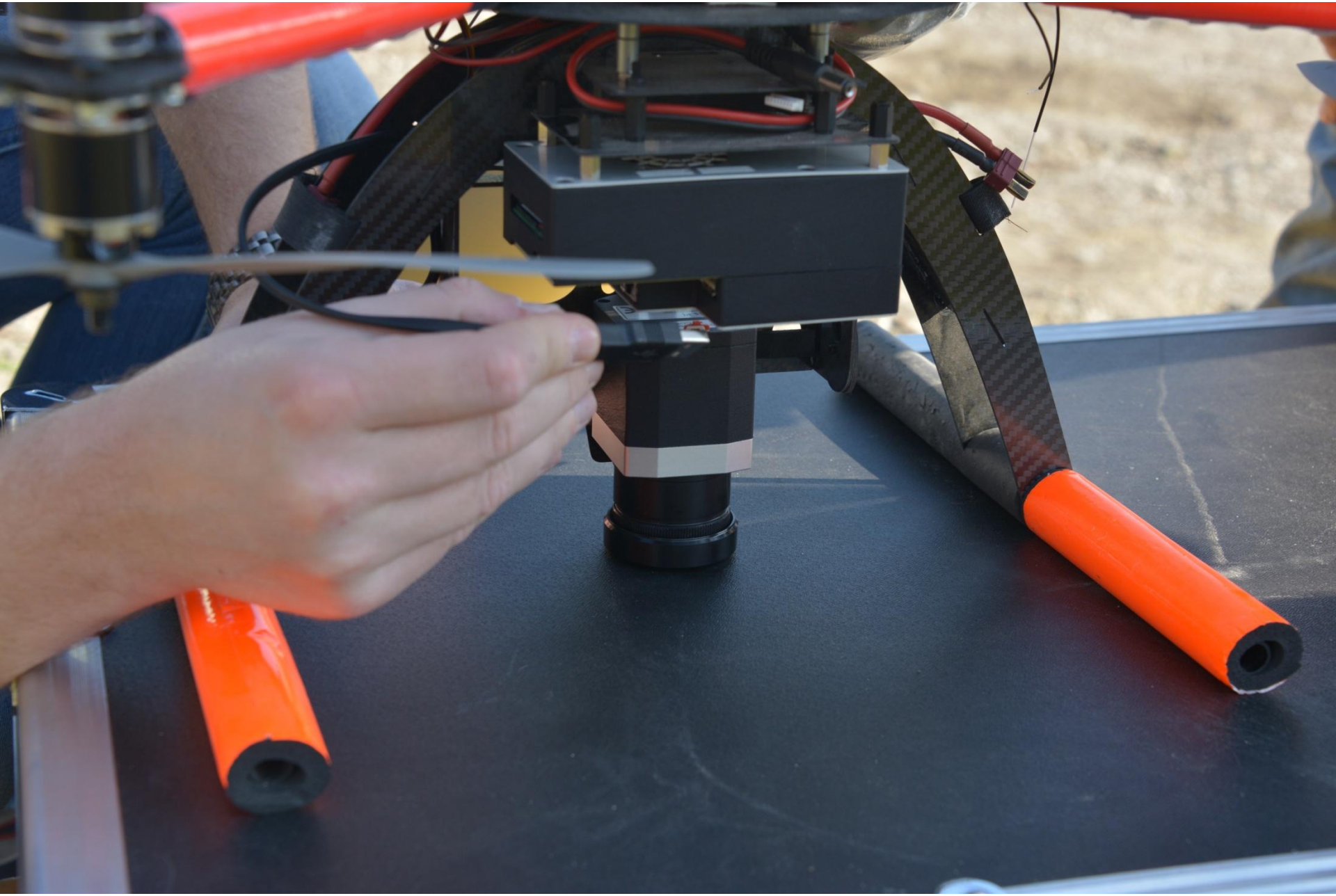

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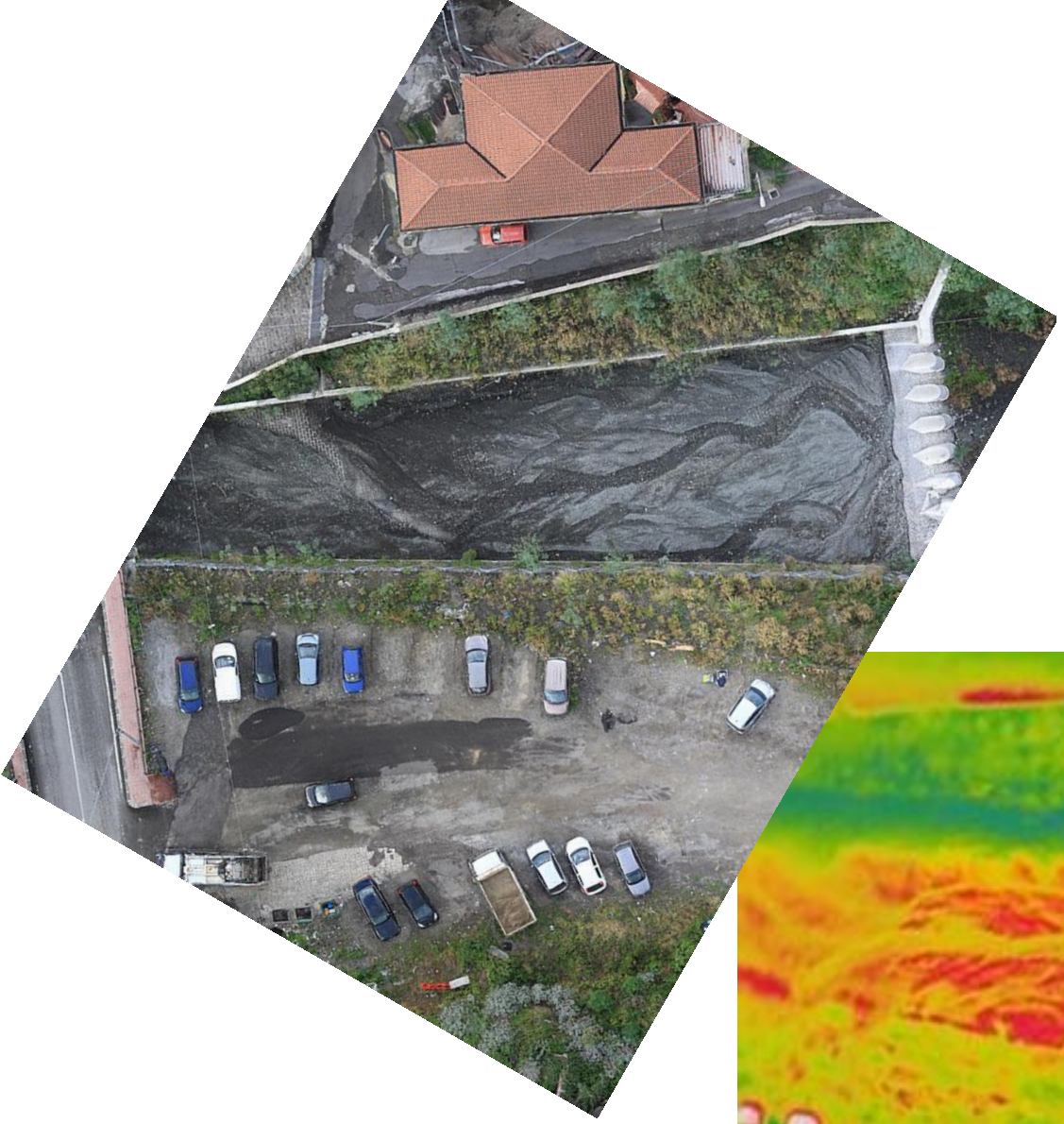

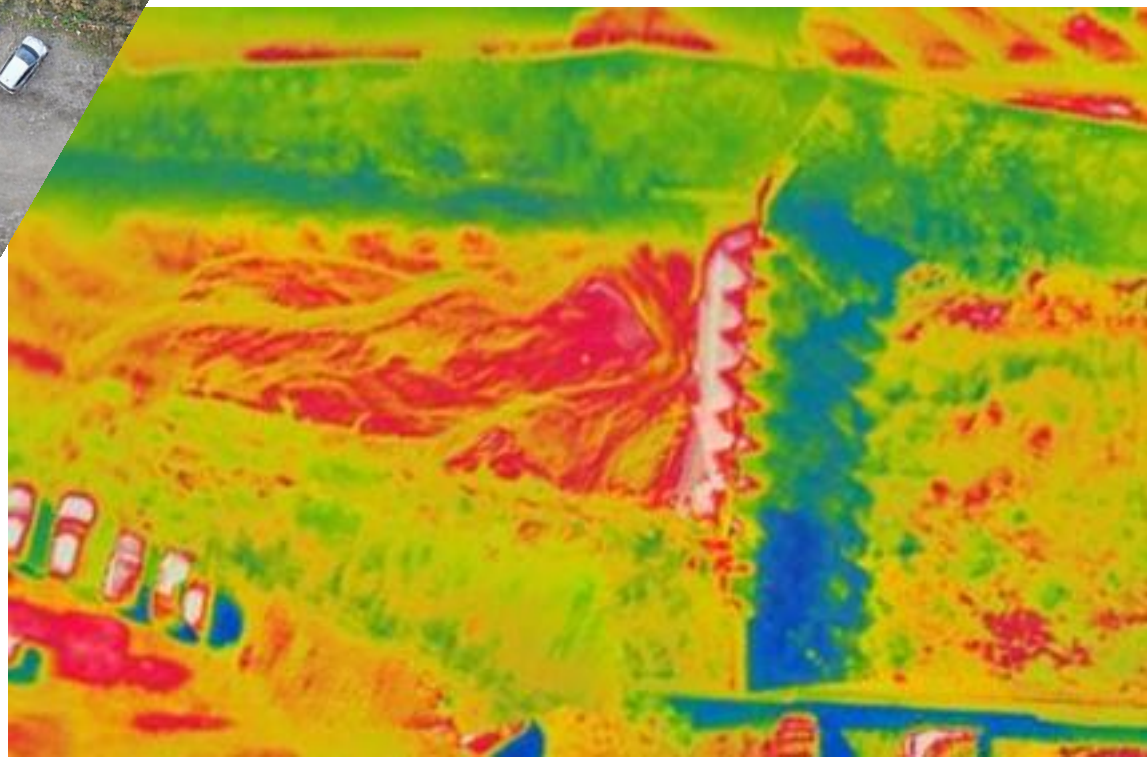

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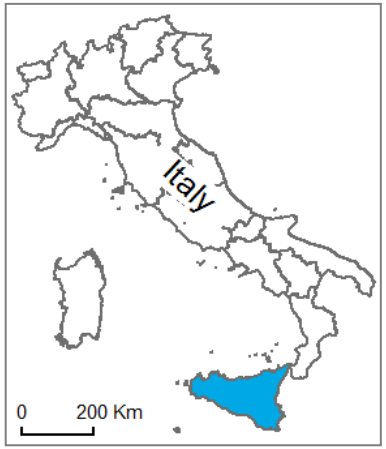
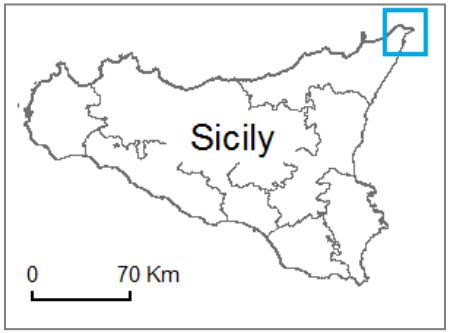
ITA
94560

The natural causes of shoreline evolution of Capo Peloro, the northernmost point of Sicily (Italy)

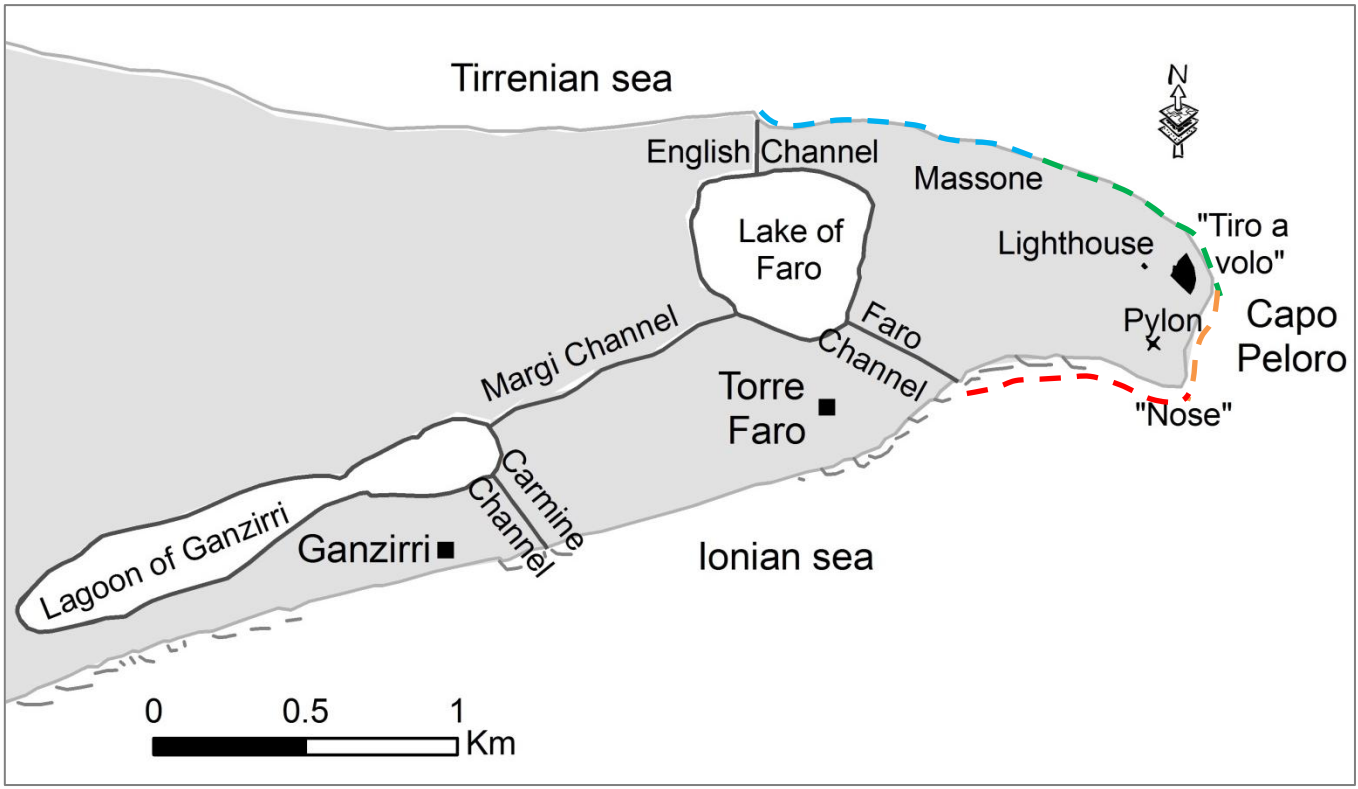
Giovanni Randazzo†, Claudia Cigala‡, Antonio Crupi‡, Stefania Lanza †

Geographical setting





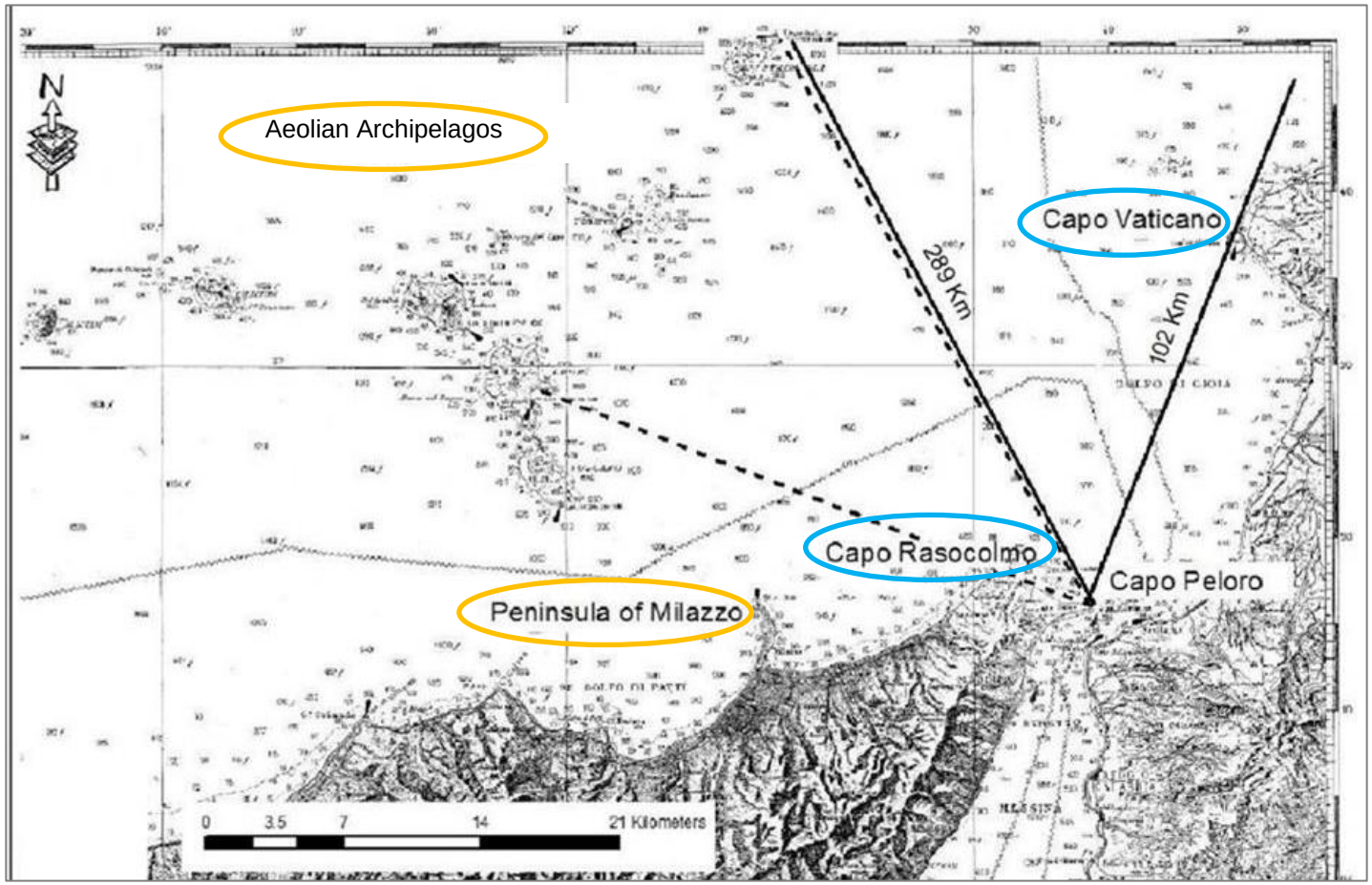
Along the coastline, four beaches, namely Massone, Tiro a Volo, Pylon and Nose, lie between the English Channel and the last of series of breakwaters, in front of Torre Faro.



The four beaches represent a continuous 2.7-km-long system which in the past was much wider and wilder, with a multi-berm shape and several dune ridges.

Fetch

Winds come from the sector 290°-330° and 331°-20°

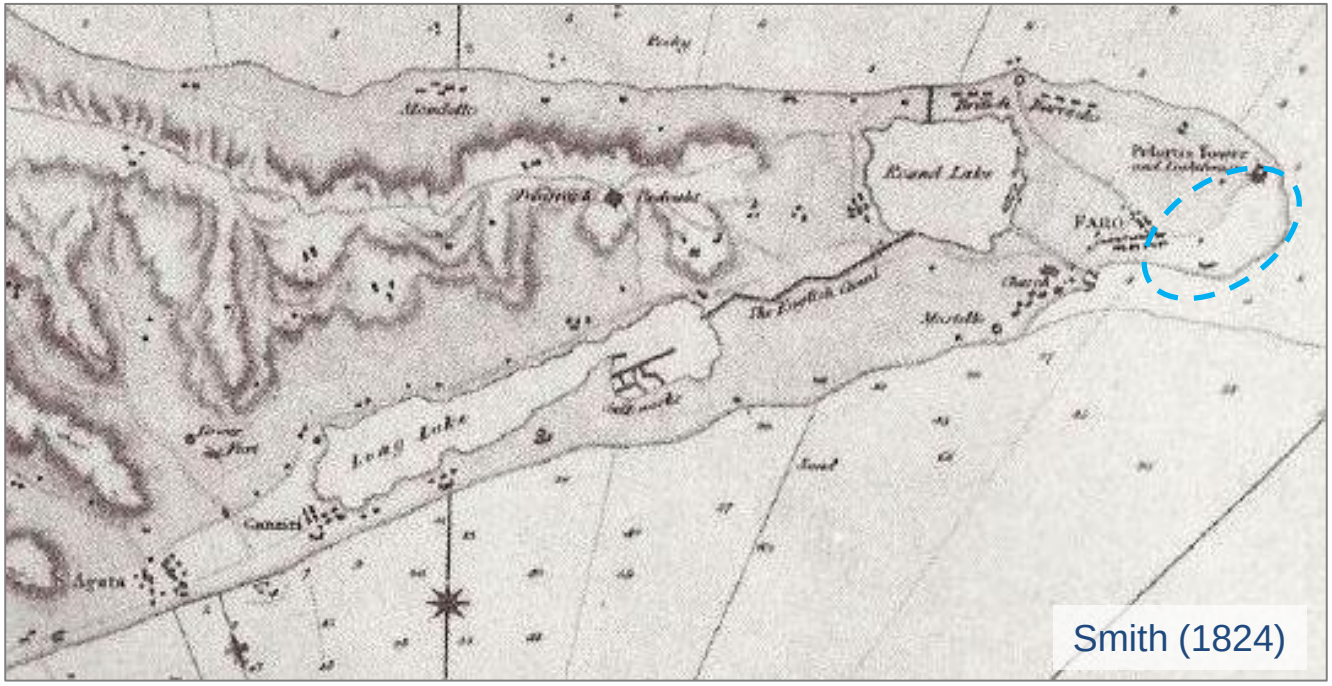


290°- 330° ⟶ by the Peninsula of Milazzo and by the Aeolian Archipelagos

331°- 20° ⟶ by the Capo Rasocolmo and by the Capo Vaticano headland

Hystorical maps

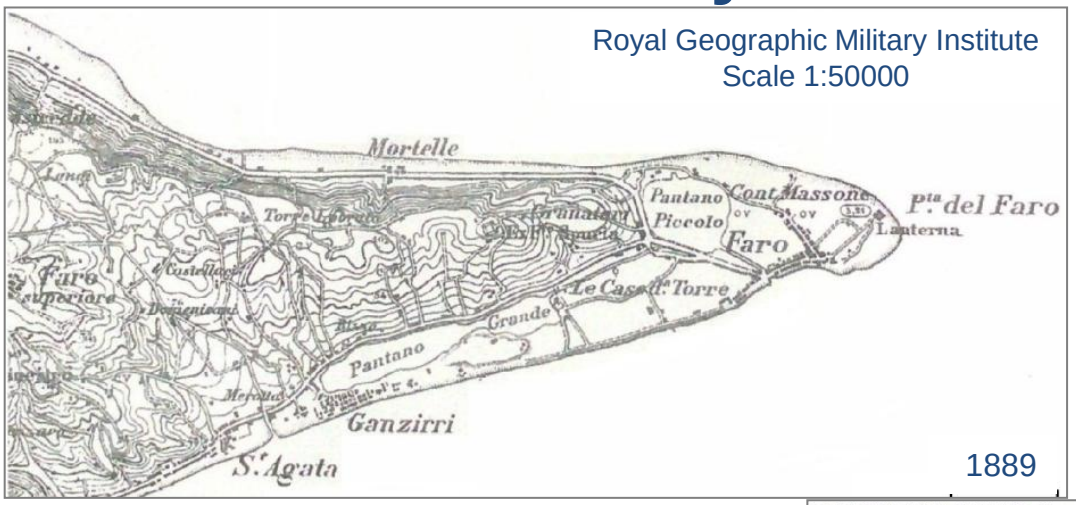
The starting point of this study



Smith (1824)

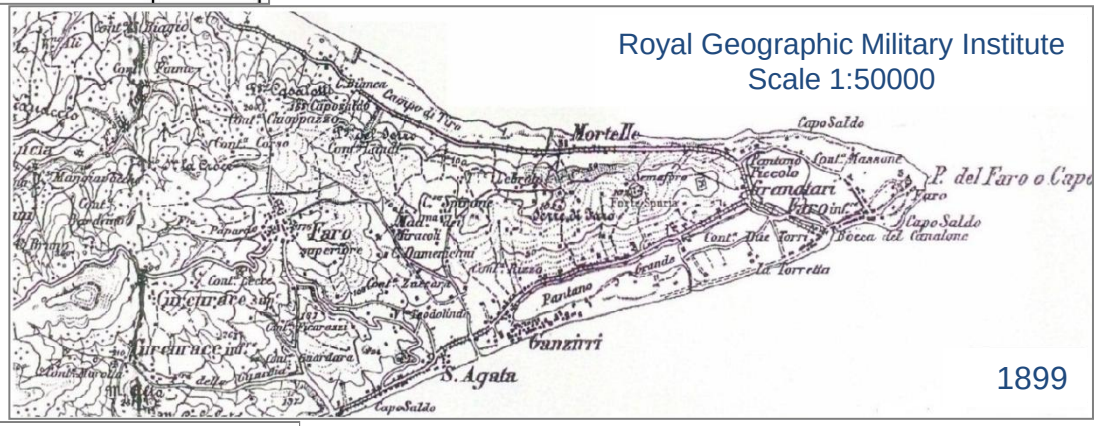
This map clearly depicts the entire coastal area, with the two lakes and a largely undeveloped coastal zone. The channels of the lake of Faro are well depicted, while the two of the lagoon of Ganzirri are not visible, occupied by salt works, indicating the economic interest of the area. The nose of the cape is curved and the beach appears large and well defined.

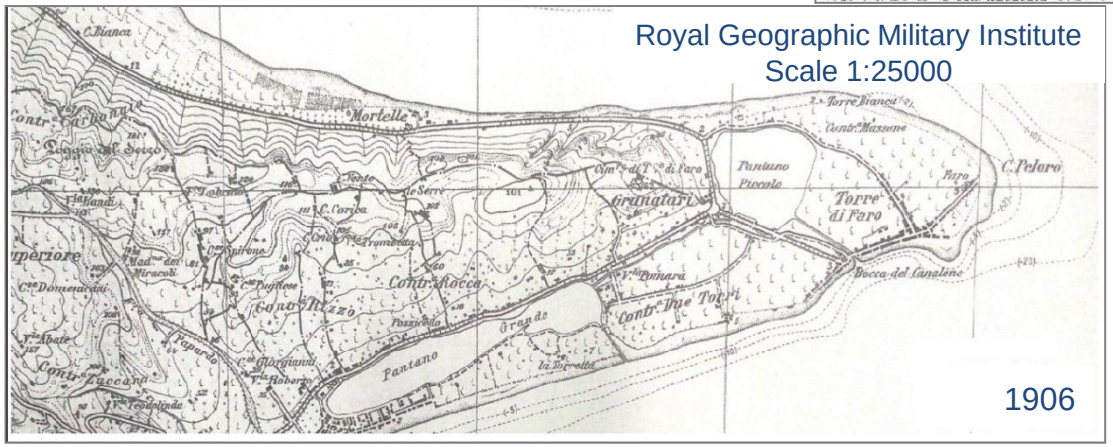
Hystorical maps



Analysis of the oldest historical maps show an evolutionary trend, free of human interference.

Between the 1889 and 1899 maps the most important change occurred on the nose of the cape.

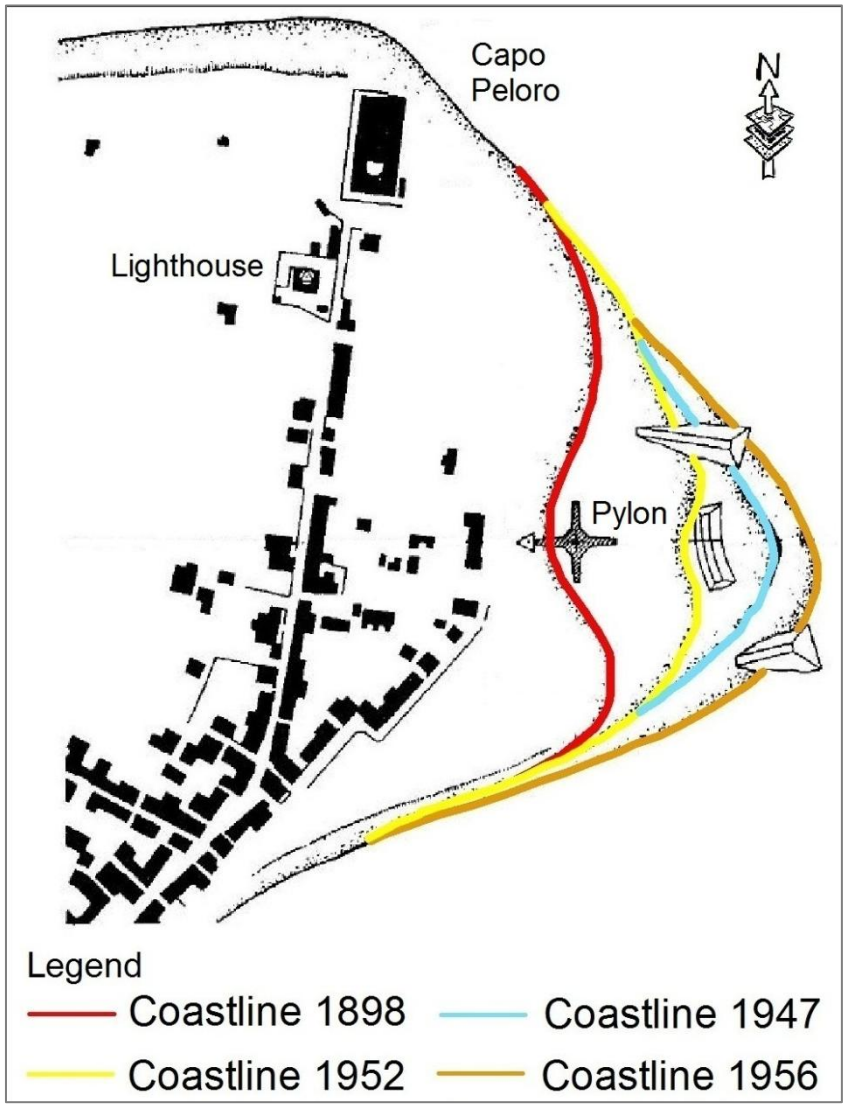




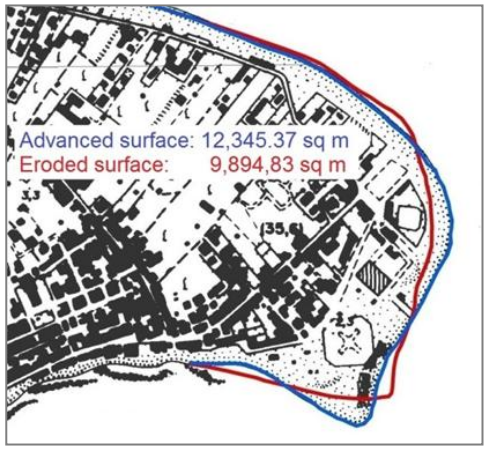
In the few years, between 1899 and 1906 maps, the beach had grown and the isobaths showed a gentler slope along the northern side while the southern coast had a steeper slope.

Hystorical maps

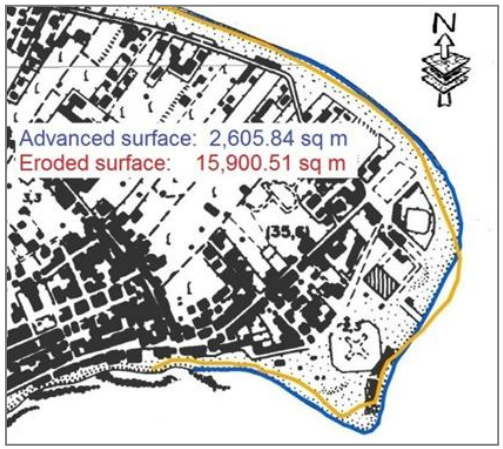
After 1906, three cartographic documents become available (1947, 1952, and 1956), from a study for the construction of an electrical pylon which connected Sicily to Italy. A composite map shows a major coastline progression advance between 1889 and 1947. In the next map, dated 1952, a major shoreline retreat is evident, while in 1956 the map shows a clear move seawards.

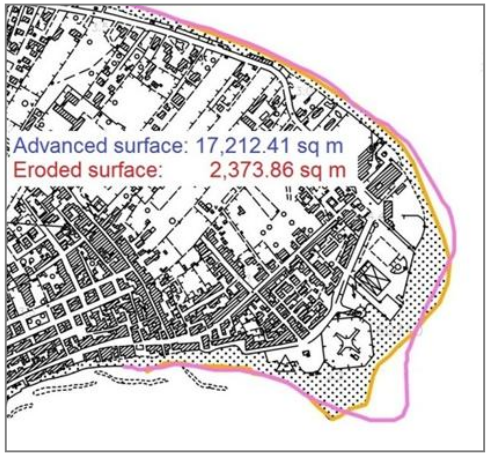


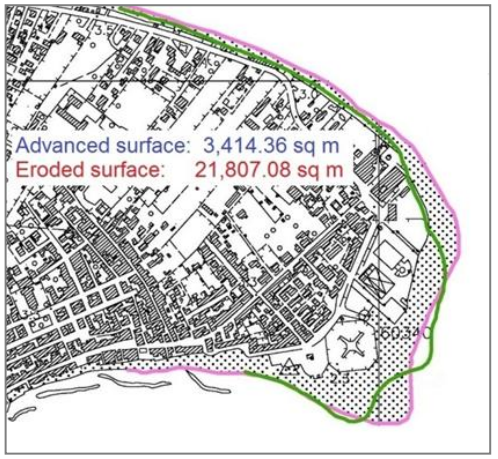
Recent evolution



1967	Military Geographic Institute, aerial photograph
1985	Technical Regional Map
1997	Technical Regional Map
2007	Technical Regional Map
2012	GPS survey

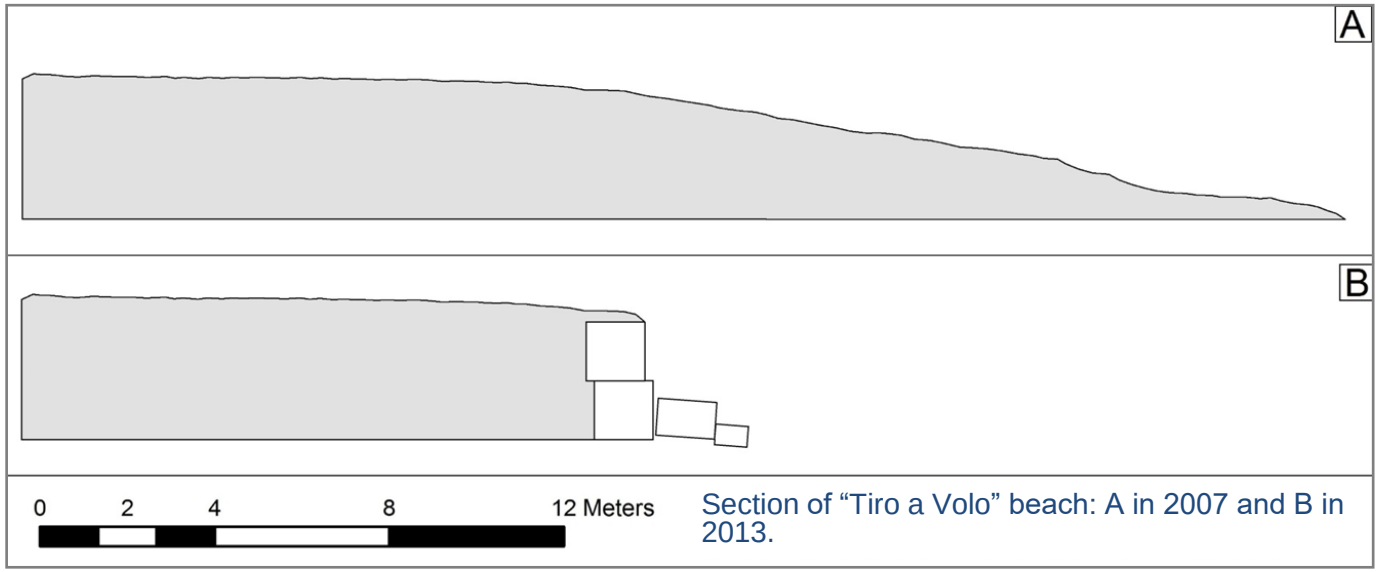






The northern coastal area (Massone beach) has maintained a certain equilibrium, while along the southern one (Tiro a Volo, Pylon and “nose”) evident continuous disequilibrium has involved only the beach sector.

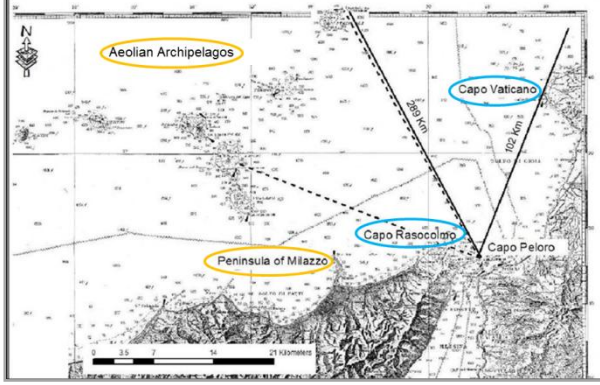
Actual situation (2012)



Section of “Tiro a Volo” beach: A in 2007 and B in 2013.

During fall 2011 and winter 2012, the beach of Tiro a Volo was strongly eroded and it retreated landwards more than previously recorded and attacked the base of the alluvial plain behind the beach. Furthermore the erosion uncovered the hard structures placed to protect the boundary of Tiro a Volo.

Wind Analysis



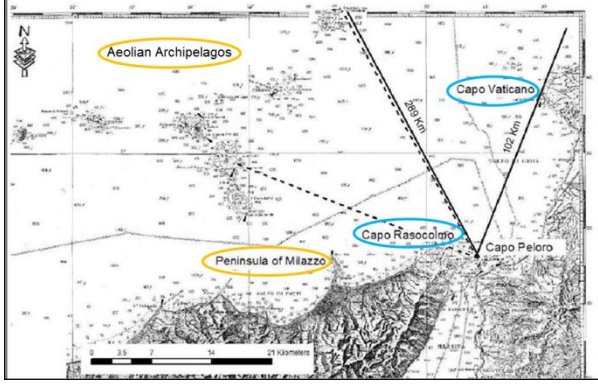
WIND DATASET

From January 1951 to December 1999	→	Three hour cadence (131,631inputs)
From January 2000 to December 2011	→	Hourly cadence (103,347 inputs) normalized to a three-hour cadence, for 12,922 inputs
From January 2012 to December 2012	→	Hourly (7,593 inputs) in km/h, normalized to the three-hour cadence with 949 observations

1951-1999	data from Military Aviation Station of Messina
2000-2011	data from Superior Institute for Environmental Research
2012	data from a private station

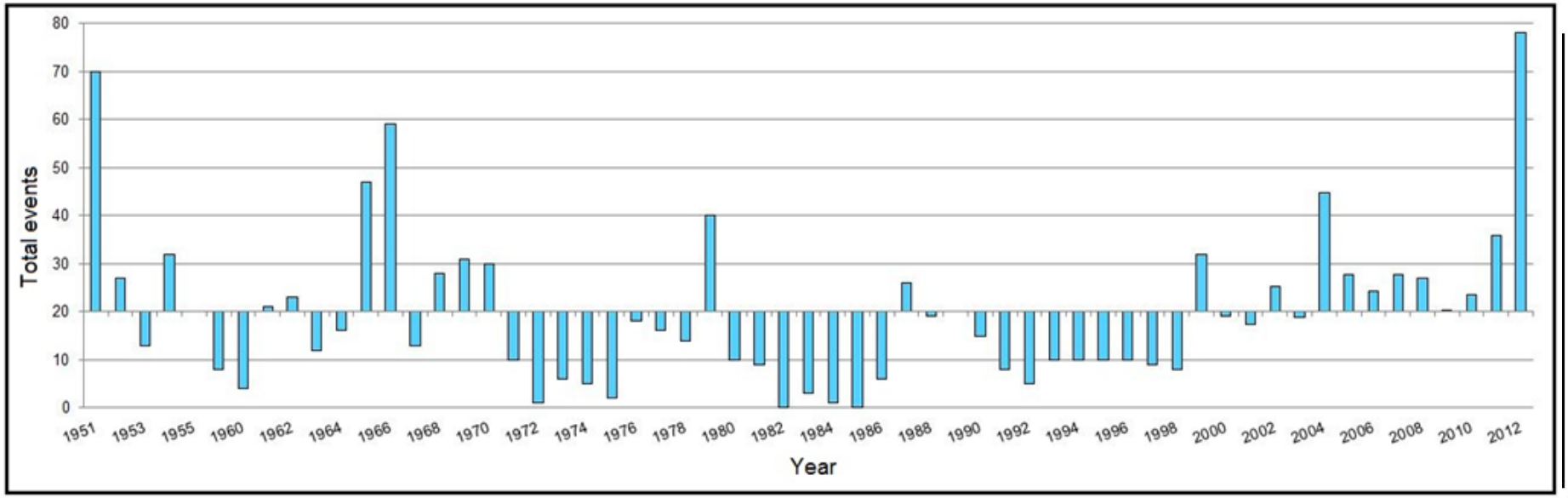
The study was further concentrated on winds blowing at speeds exceeding 30 km/h

Wind Analysis



290°-20°

Annual average = 20 events



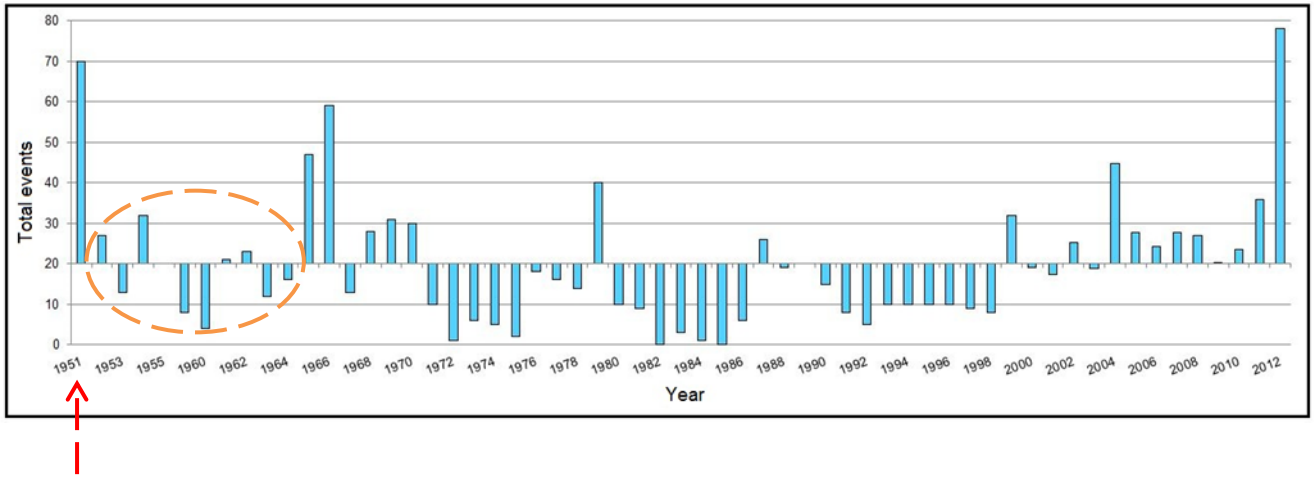
For the first 20 years of observation (51-70), there is a regular alternation of pairs or triads of the windiest years (more than average) with couples or single years that are less windy than average.

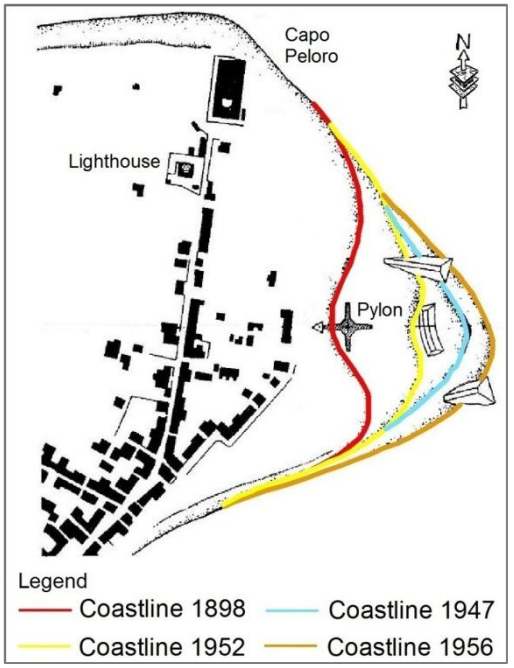
These winds remain around the average until 1999, when there was a peak of 27 occurrences (78% above 60 km/h) followed by a series of occurrences always above the annual average, while it was doubled in 1964, 1965, 1966 and 1979.

Between 1987 and 1990 the highest frequency of wind over 60 km/h was recorded.

The year 2012 was the windiest of the entire time series for the sector 290°-20°, which is the windiest year in the dataset.

1898-1947	1947-1952	1952-1956
+	-	+

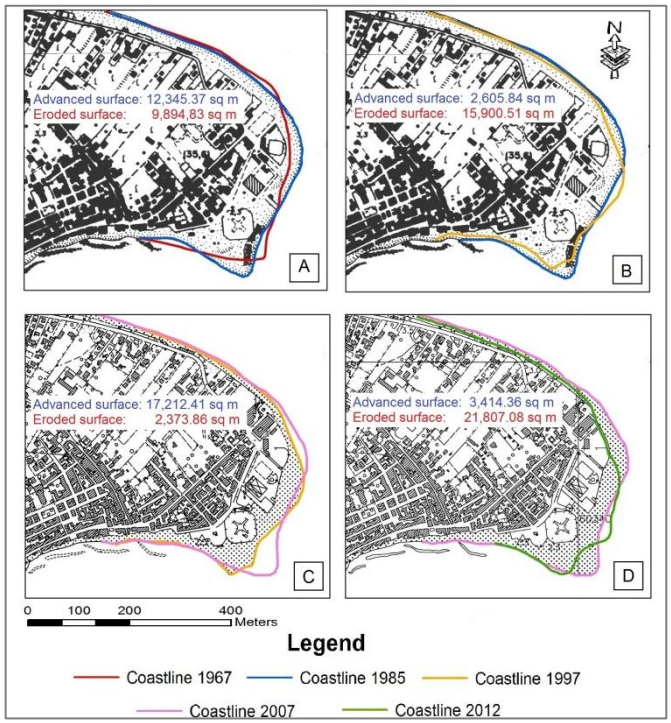


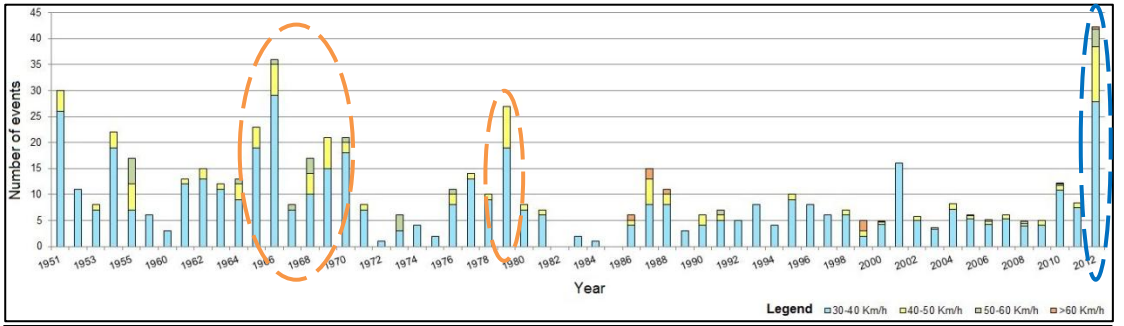


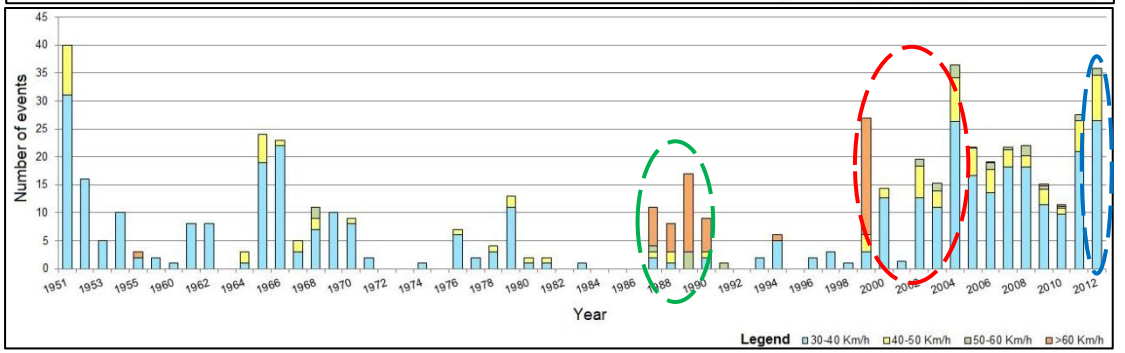
1947 → accretion → 1908 earthquake's material deposited on the beach

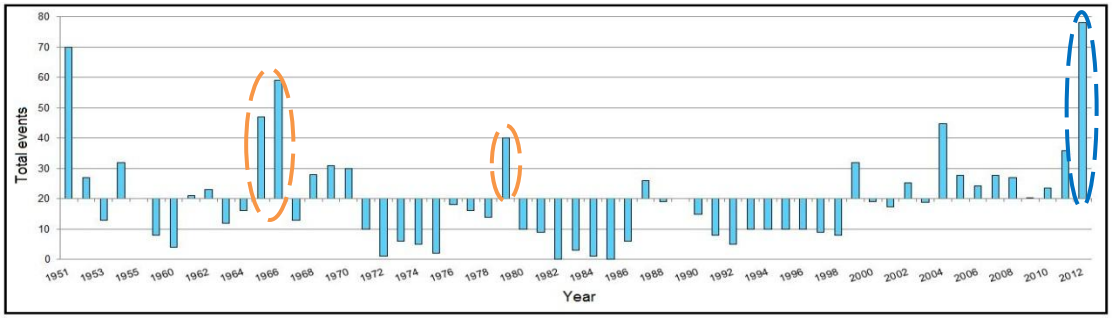
1952 → erosion → 1951 extreme weather conditions

1956 → accretion → materials not completely dispersed offshore were re-deposited during calm periods









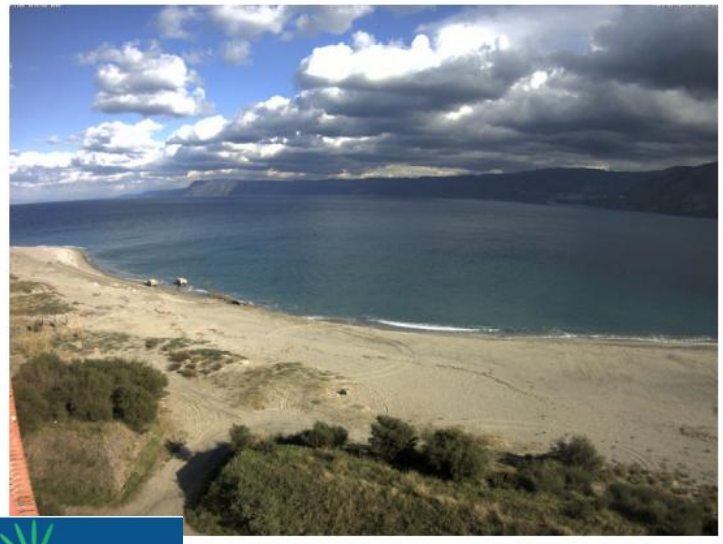
	1967-1985	1985-1997	1997-2007	2007-2012
Advanced surface	+12,345.37	+2,606.56	+17,213.07	+3,414.36
Eroded surface	-9,895.13	-15,900.51	-2,373.86	-21,808.19

Video – monitoraggio dell'area di studio

Fotocamera Nord – Est

16/06/2015

17/01/2016



20/01/2016

14/06/2016

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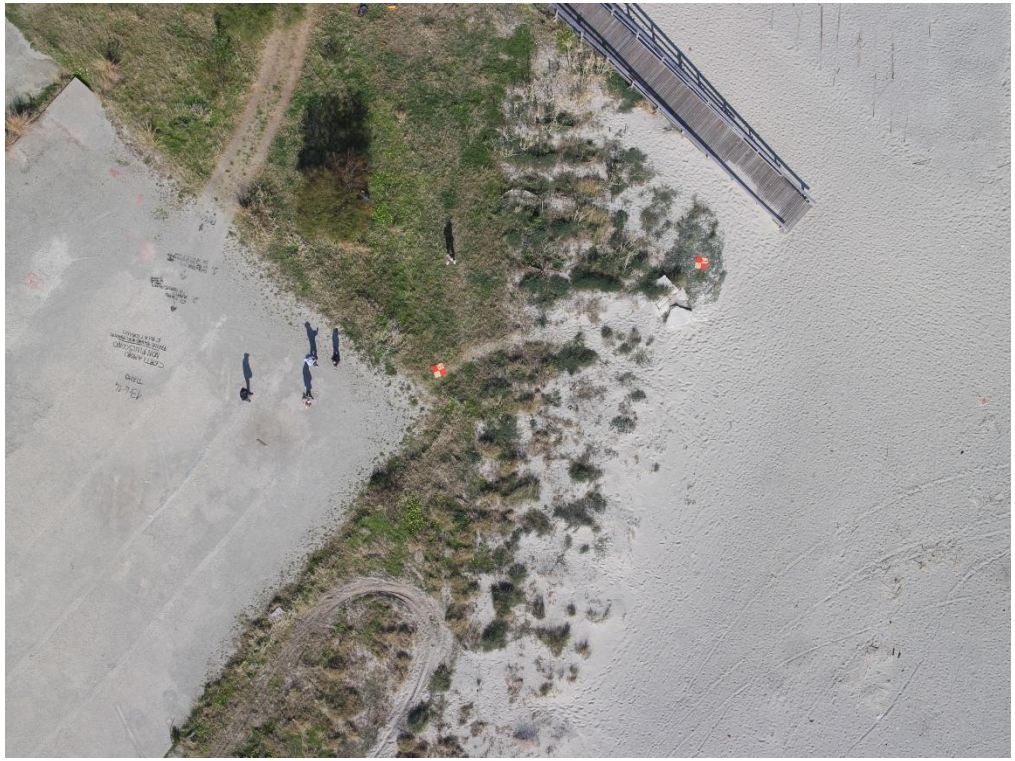
Ortofoto e **DEM** dell'area di studio dalla Torre degli inglesi al pilone

Per la realizzazione dell'ortofoto e la restituzione del relativo DEM:

- Sono stati scelti 4 punti di decollo e atterraggio dell'APR
- Sono state fatte 6 missioni di volo
- Rilevati 20 GCP (Ground Control Point)



- Scattate 150 foto
- Quota di volo 60 metri

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