



Sensing the invisible for a sustainable management of Underwater Cultural Landscape

Hints from the Baia Submerged Archeological Park

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Italian-French Bilateral Cooperation in Heritage Science: “Human-centered approach for cultural heritage in green transition: disciplines talking to each other”

Online event

Thursday, 10th November 2022

Acoustic Remote Sensing

Simultaneous mapping of morphology, composition and archaeological targets

1

Seafloor environment and cultural resources

Improving the integration of cultural heritage within the marine science

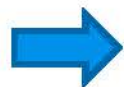


Ocean Decade Heritage Network as part of UN Decade of Ocean Science 2021–2030
Integration of UHC into Marine Spatial Planning (MPA)

2

Systematic non-invasive in situ monitoring of UCH

Implementation of preventative measures



UNESCO 2001 Convention on the protection of the UCH

3

Fruition of UCH – both diving and non diving public

Continuous overview of the seabed morphology and associated cultural features



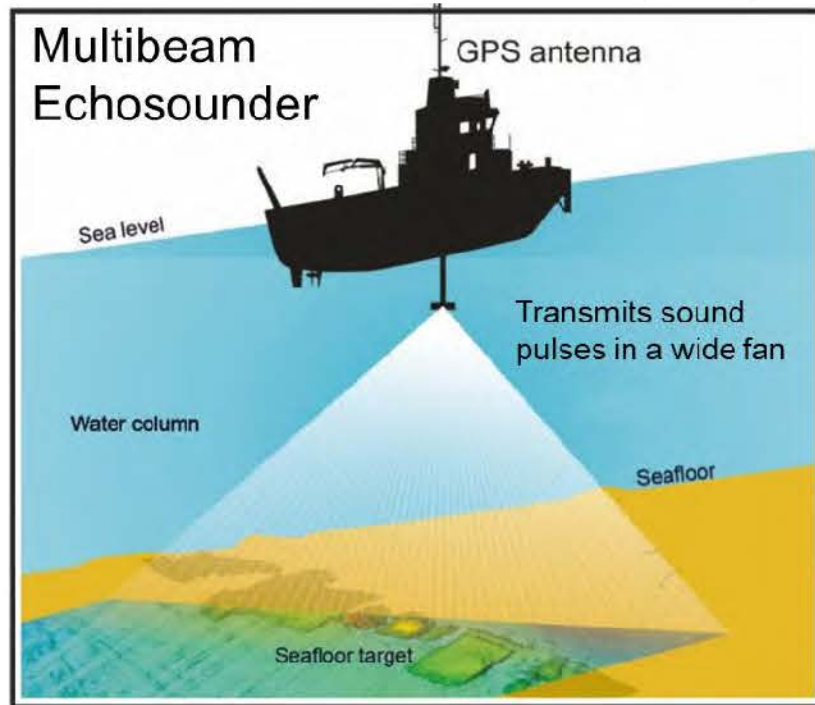
To raise awareness and access to otherwise unreachable (or difficult to reach) UCH



Acoustic Remote Sensing Methods

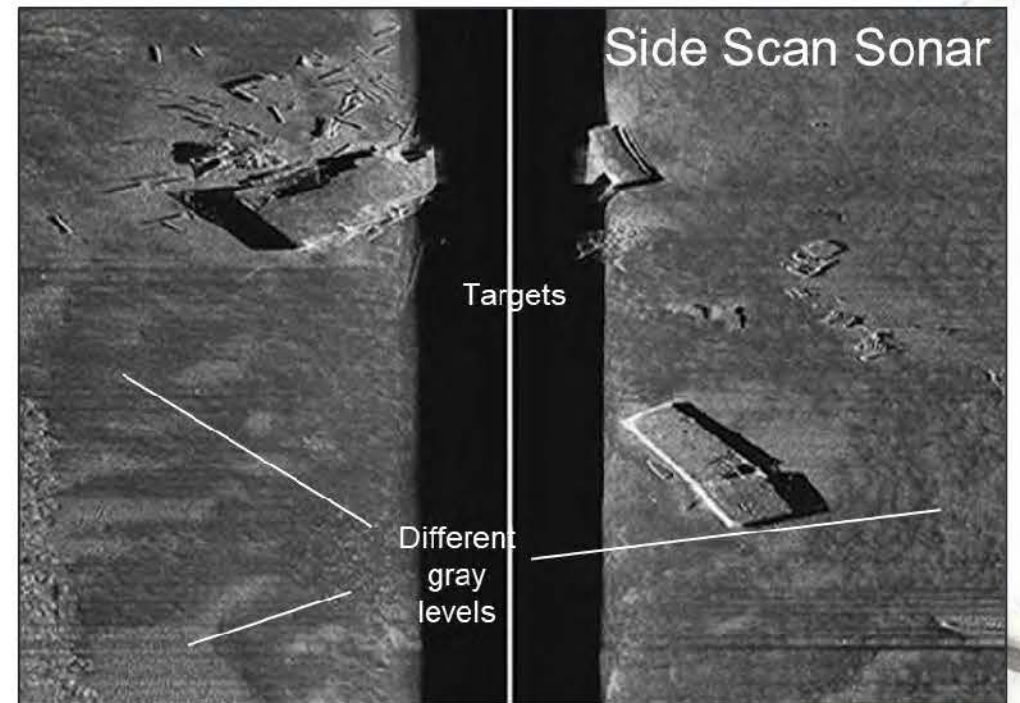
"The gathering of information from a distance"

1. Quantitative water depth measurements (3D)



Seafloor morphology and targets
(Arrival times and directions of returning echoes)

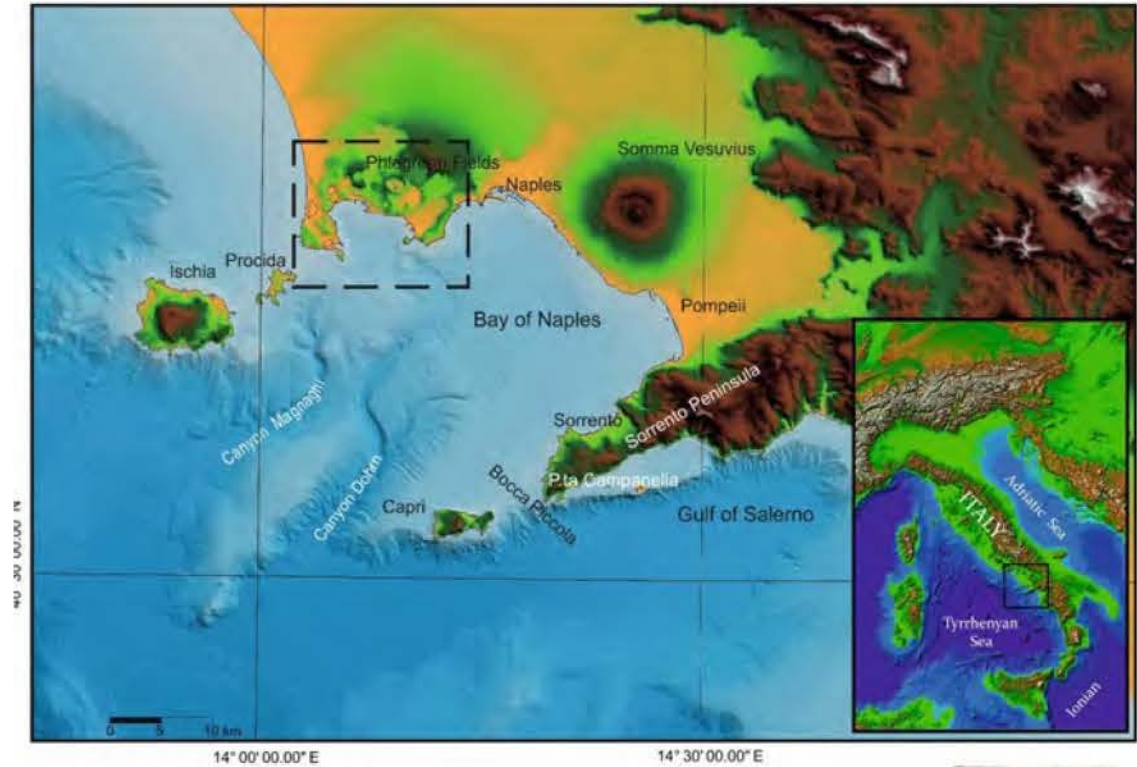
2. Seafloor acoustic reflectivity Energy of the echo intensity (2D)



Seafloor composition and targets
(Gray levels associated with seafloor composition)

Baia underwater Archaeological Park and Marine Protected Area

- Phlegraean Fields active Volcanic District
- Vertical ground movements “Bradyseism” Since Roman Times
- Roman artifacts and structures , including Villas, luxury buildings, landing ports and thermal complexes
- Located up to 15 m bsl



Submerged hydrothermal vents

pH = 5.95/7.16
Normal seawater pH value: 8



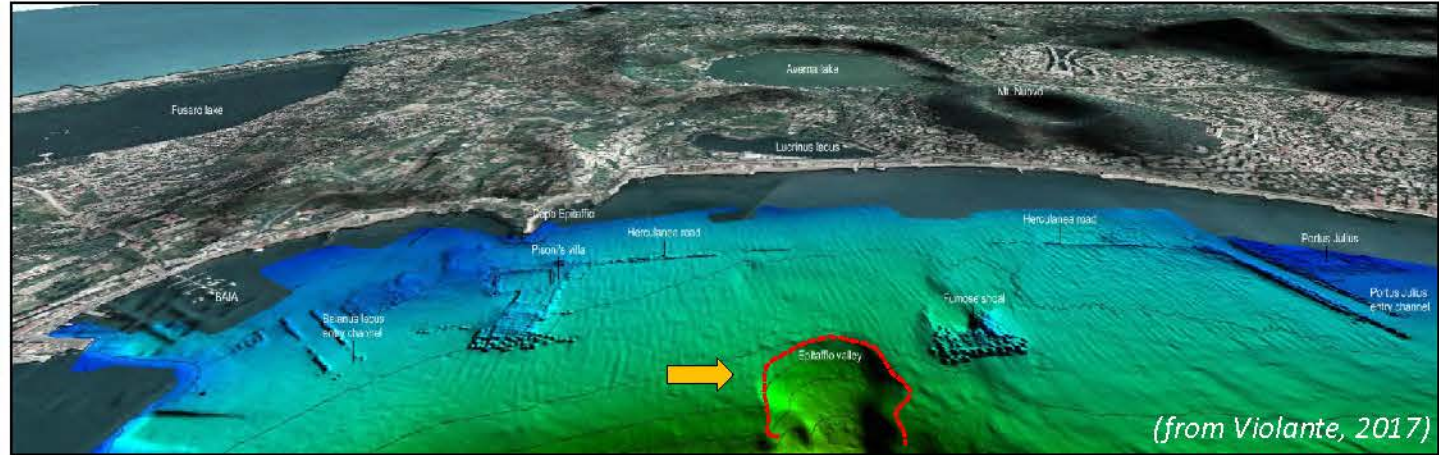
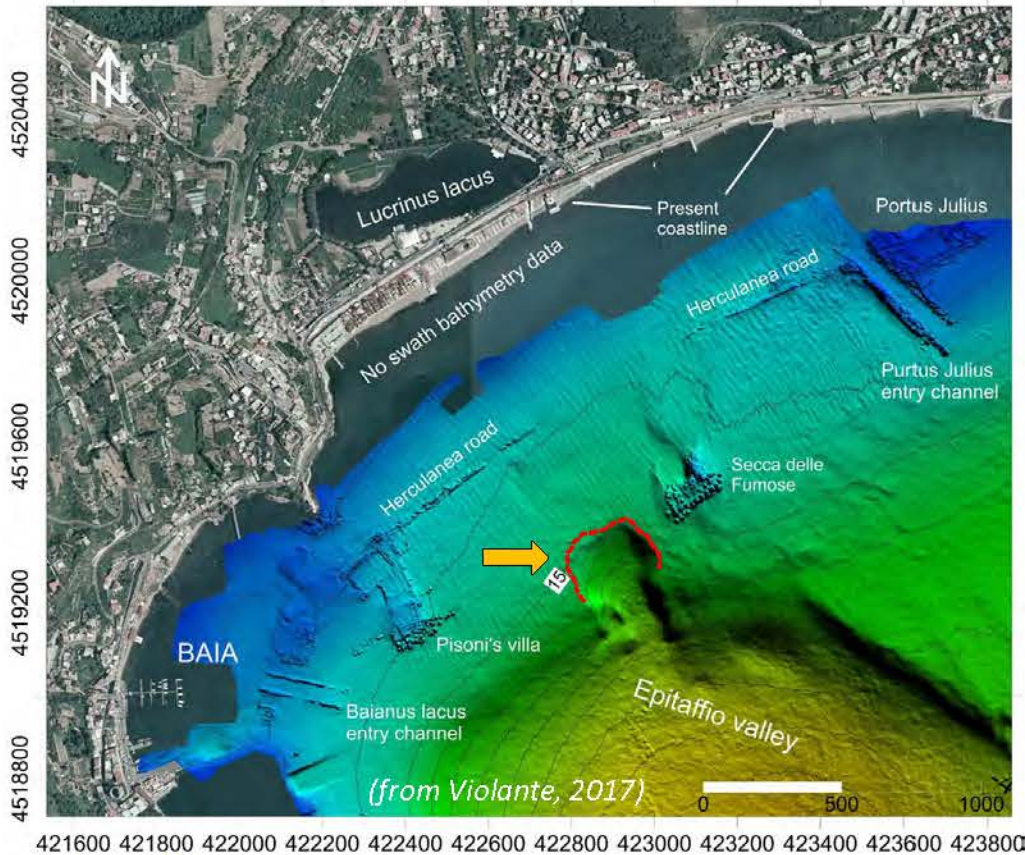
Publicly Accessible Underwater Cultural Heritage Site



Access provided by dive clubs (6) and glass-bottom boat visits (3)



High resolution bathymetric data



Archaeological target and geomorphological features

- Flat sub-horizontal coastal shelf area (2° slope)
- Identification of the main archeologic targets
- Hazard-related seafloor features

Continuous overview of the seabed morphology and associated cultural features



Ecological value of UCH

Embedded in the seabed, artifacts and wrecks acquire ecological value

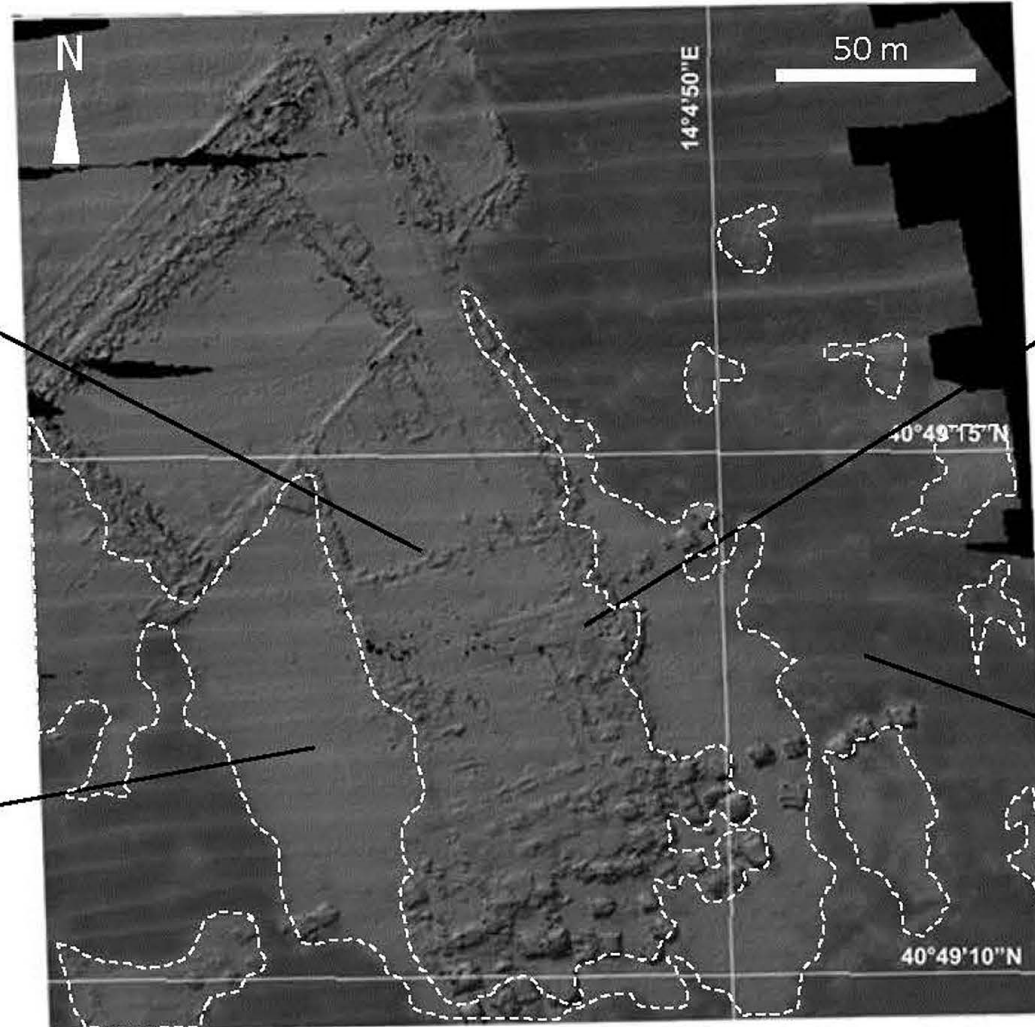
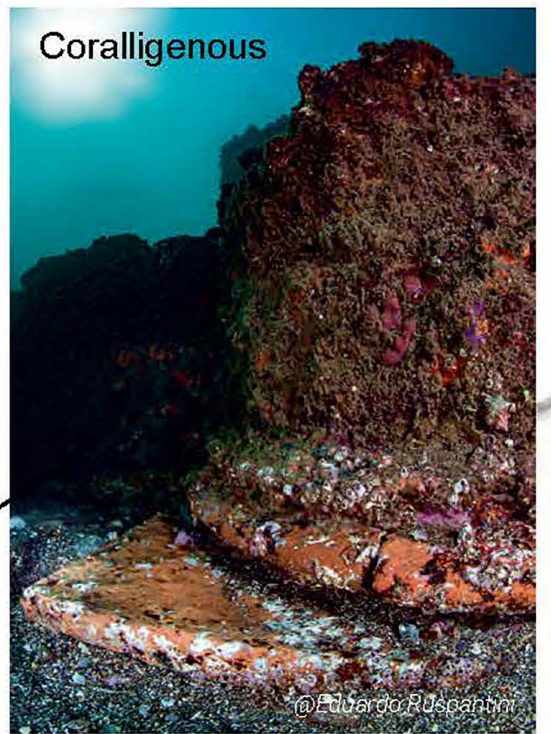
- *Cultural heritage can be an important component of marine ecosystems*
- *Cultural heritage is fundamental to understanding how many coastal and marine ecosystems achieved their present form*
(UN 2030 Agenda for Sustainable development)



Pisoni's Villa

Baia Archaeological Park

Photophilic algae



Coarse sand



Building fragments with biogenic concretions



Final remarks

1. Relationship between submerged cultural heritage and seafloor environment
 - Improving the integration of archaeology and cultural heritage management within the marine science
2. Time-saving non-invasive method that can be used as an *in situ* monitoring tool
 - inspection and to identify protective measures to a submerged sites
3. Digital resources that are of high spatial resolution, repeatable and quantifiable, and that can be easily integrated and stored in digital infrastructures
 - Public use through dedicated platforms



Thanks for your attention!

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