Geohazard assessment of submarine canyon headwalls activity along the Ionian Calabrian and Apulian margin (Ionian Sea)

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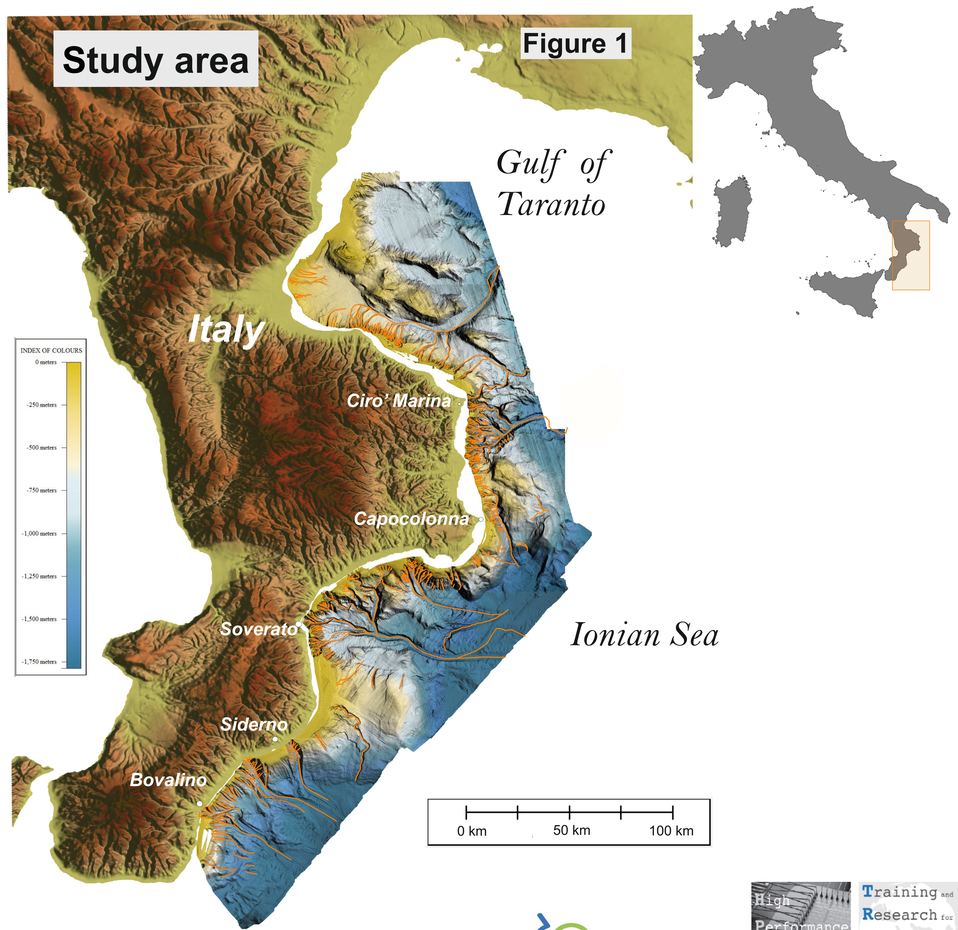
SCAN ME!

This work is part of my PhD research project at the University of Trieste in collaboration with the OGS (National Institute of Oceanography and Applied Geophysics)

Introduction

Submarine canyons are steep seabed incisions that occur on continental shelves and slopes worldwide, both on passive and active margins, serving as major conduits for sediment transport from shallow waters to deep oceans. The morphological expression of submarine canyons that develop on active margins, is determined by the interaction between the surface deformation related to subduction zones and the mass redistribution by surface processes [3].

The Ionian Calabrian and Apulian margins are part of the active Ionian forearc basin, which is experiencing an intense uplift since ca.1 Ma [4] and is severely incised by a dense network of submarine canyon systems. Such submarine environments are able to host potential geohazard processes and thus represent a threat for coastal areas and infrastructures [Fig. 1].



Motivation & aim

The seabed in the study area is sculped by 10 submarine canyon systems characterised by different sinuosity, ramification, longitudinal profiles and headwall geometries [Fig.1]. Some of the canyon headwalls form hierarchic systems with five and more canyons merging into dendritic systems [Fig.1].

Despite recent advances in seafloor imaging and mapping, our knowledge is still insufficient to allow quantitative studies to take place along submarine canyon headwalls. A geostatistical approach followed by an analysis of the involved grain size and sediment type from surface to greater depth, combined with the identification of the main tectonic structures, could overcome such obstacle and allow us to build a model for canyon headwall inception and evolution [Fig.2].

We aim to:

~Provide a quantitative analysis of the morphology features indicative of canyon erosion.

~Examine recent erosional and depositional morphological features within canyon headwalls to investigate their temporal evolution.

The main outcomes of my PhD Research is aimed at:

~providing a model for submarine canyon headwall erosion which could be used to make a step forward from assessments based on morphological characterisation to hazard susceptibility prediction in coastal areas.

~increase the capacity of ocean science community to interact more with stakeholders dealing with risk assessment.

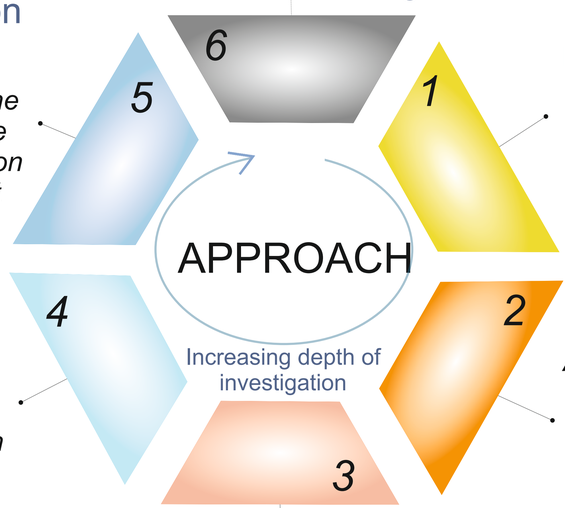
Model building

Multichannel seismic reflection data analysis

Interpretation of seismic profiles with the aid of seismic attributes to analyse the impact of tectonics on submarine canyon headwalls inception and enlargement

Seabed mapping and morphometric analysis

Identification of all the canyon headwall related features and their parametrisation with GIS tools



Quantitative parametrisation of sub-bottom reflectors

Determination of marine sediment type from high-resolution geophysical data in terms of lithology range values

Geostatistics

Analysis and quantification of the spatial heterogeneity of measured morphometric attributes through an object based image analysis (OBIA)

Multibeam backscatter data analysis

Seafloor sediment classification through image-based texture classification

Figure 2

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