EMB Science Webinar

# MARINE GEOHAZARDS IN EUROPE
## A hidden threat to coastal settlements and the Blue Economy

Expert Group on Marine Geohazards
Position Paper 26

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

European MARINE BOARD
Advancing Seas & Oceans Science

EMB Science Webinar

# MARINE GEOHAZARDS IN EUROPE
## A hidden threat to coastal settlements and the Blue Economy

H. Kopp, F.L. Chiocci, C. Berndt, M.N. Çagatay, T. Ferreira, C. Fortes, E. Gràcia, A. González Vega, A.J. Kopf, M.B. Sørensen, N. Sultan, I.A. Yeo

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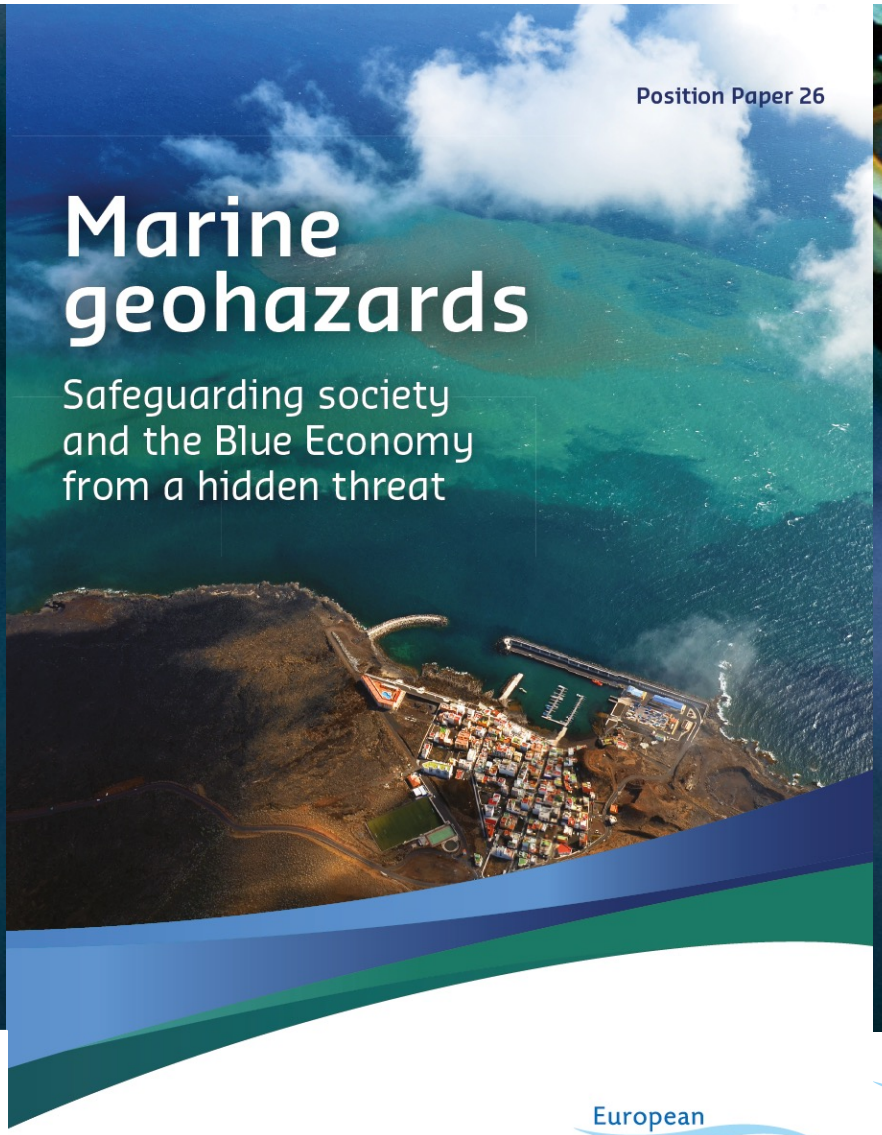
**Marine Geohazards** pose a significant threat to:

- coastal population
- development of Blue Economy

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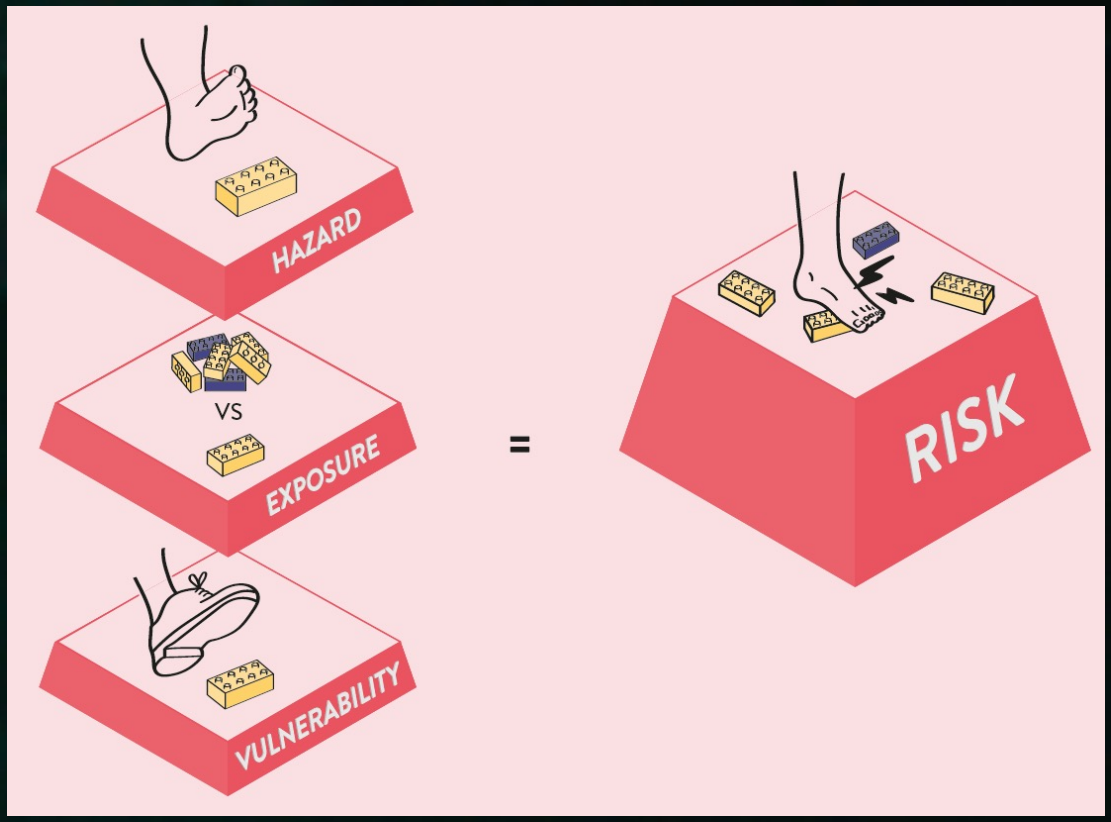
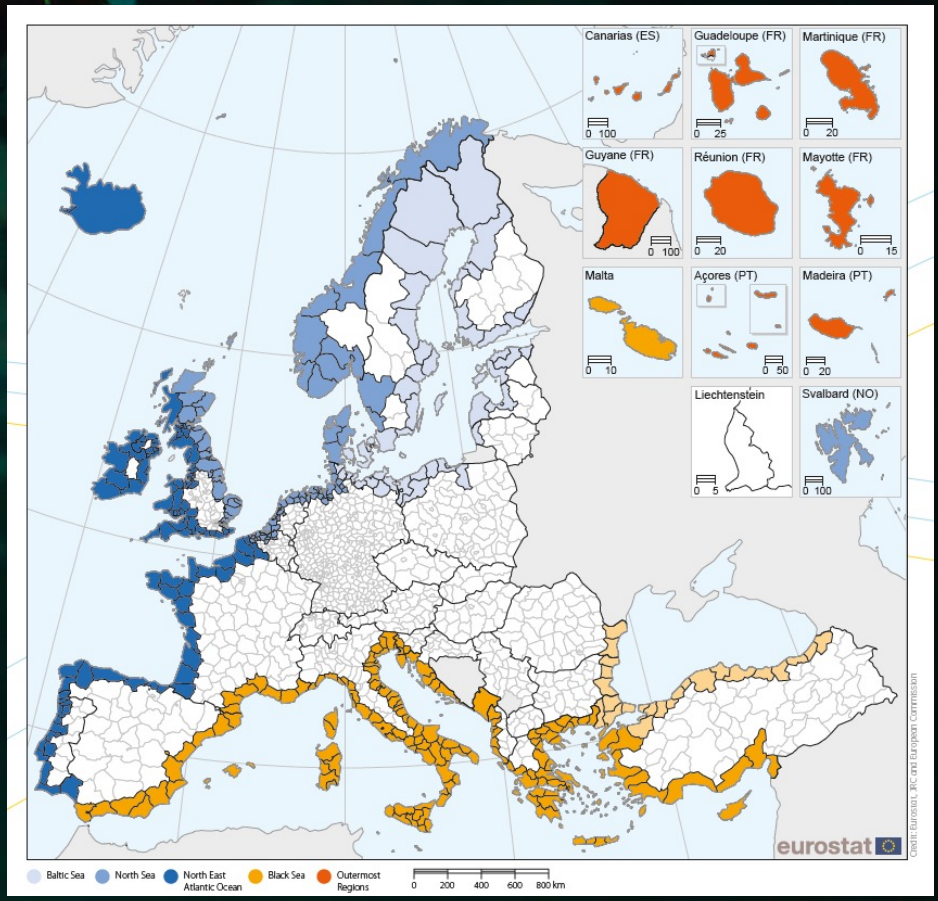
# Is Risk from Marine Geohazards Increasing in Europe?

**Risk is the product of hazard, exposure and vulnerability.**



# What Types of Hazards Are We Facing on Our Shores?



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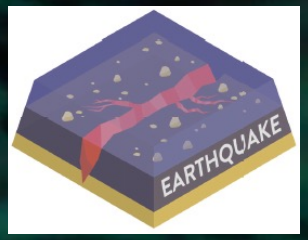
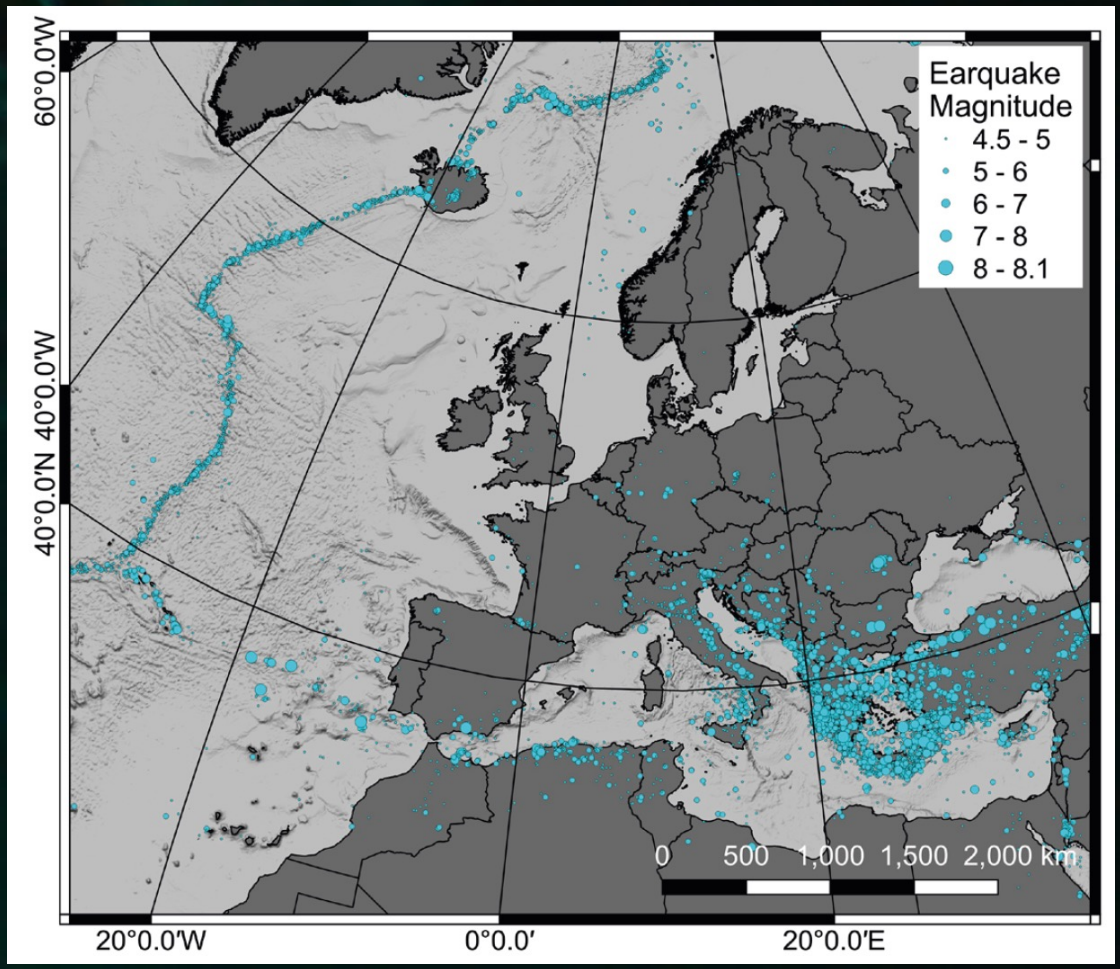
- Earthquakes



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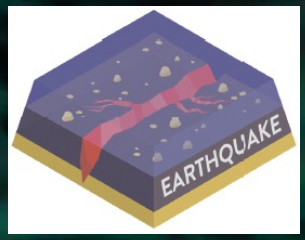
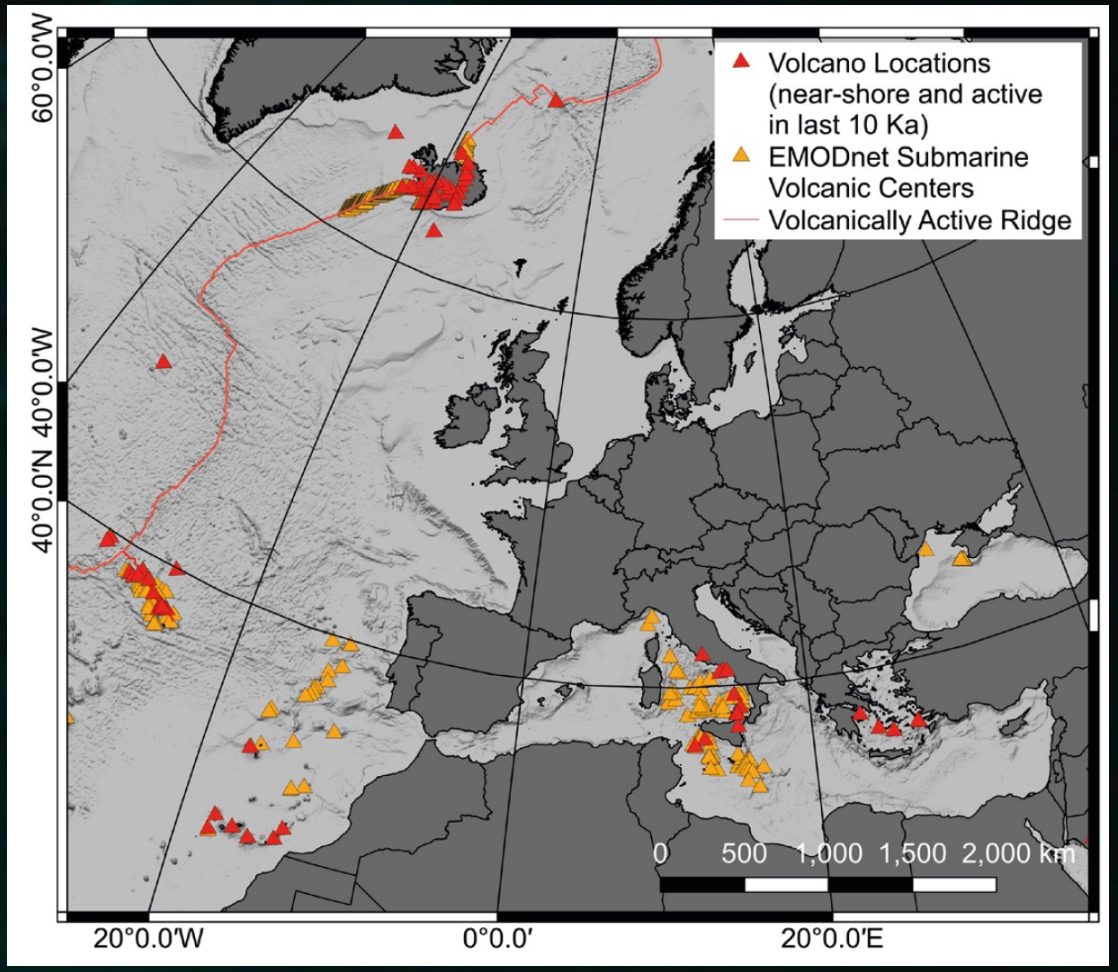



1908:
Messina-Calabria Disaster

# What Types of Hazards Are We Facing on Our Shores?

- Earthquakes
- Volcanoes

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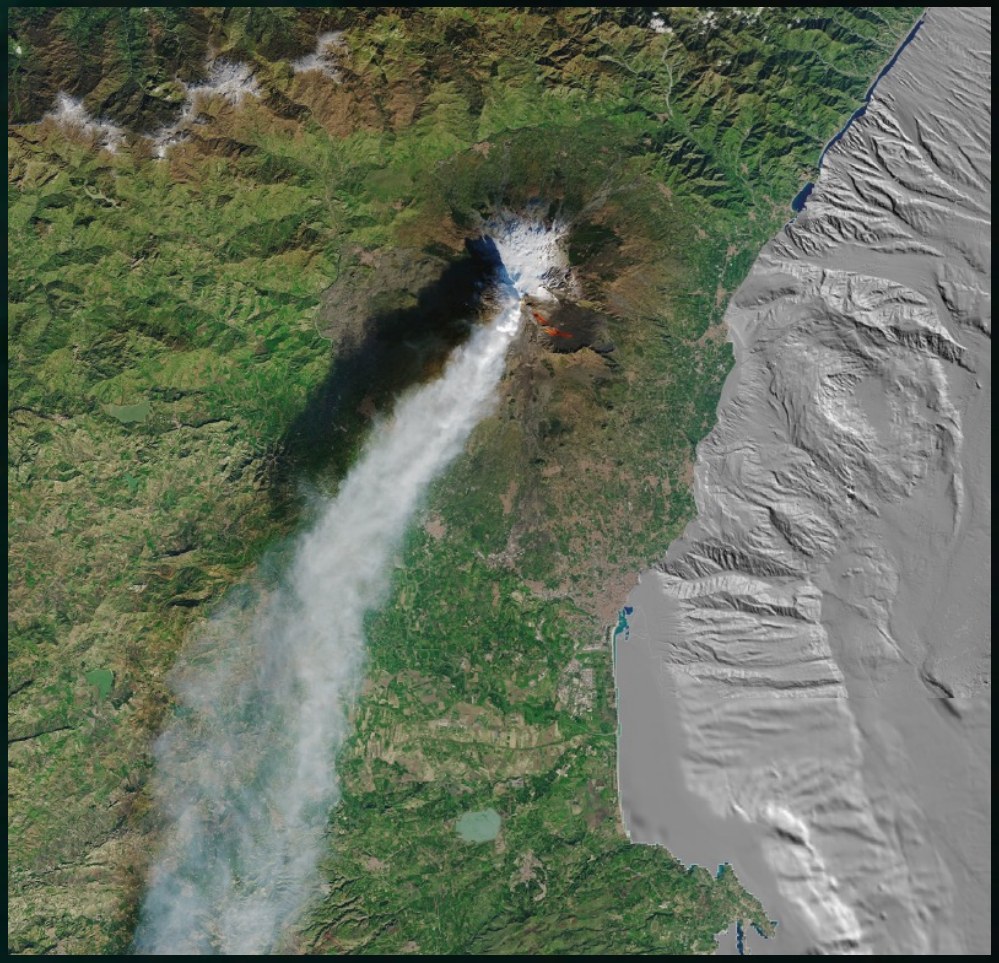
Mt Etna and its shoreline-crossing eastern flank



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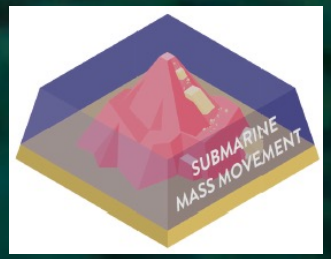
Santorini island: rim of a large caldera left after a super-eruption in the Bronze Age. A new volcano, Nea Kameni, is forming.

# What Types of Hazards Are We Facing on Our Shores?

- Earthquakes
- Volcanoes
- Mass movements

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- Earthquakes
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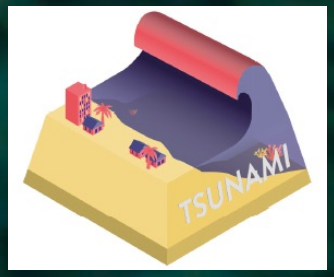
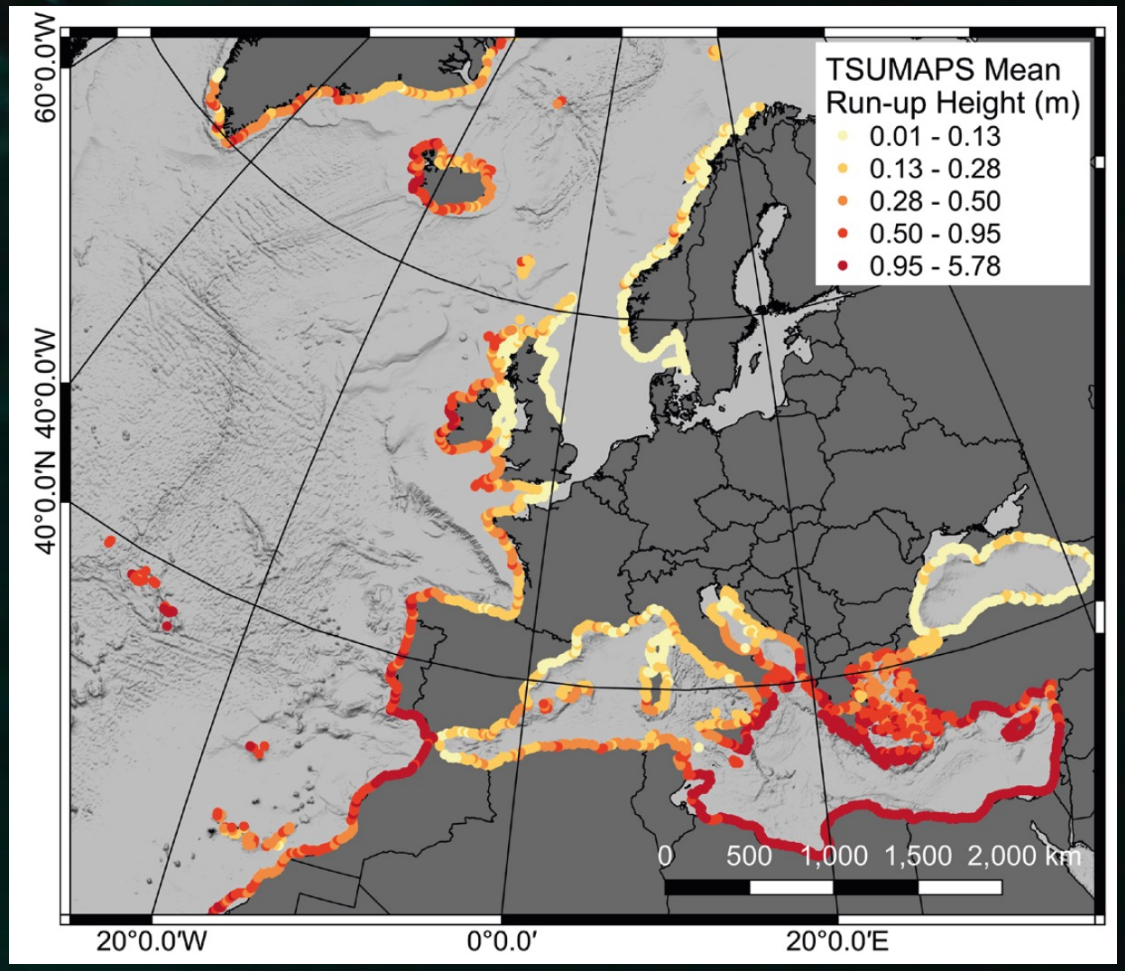
- Mass movements
- Tsunamis



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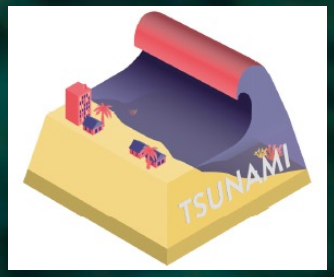


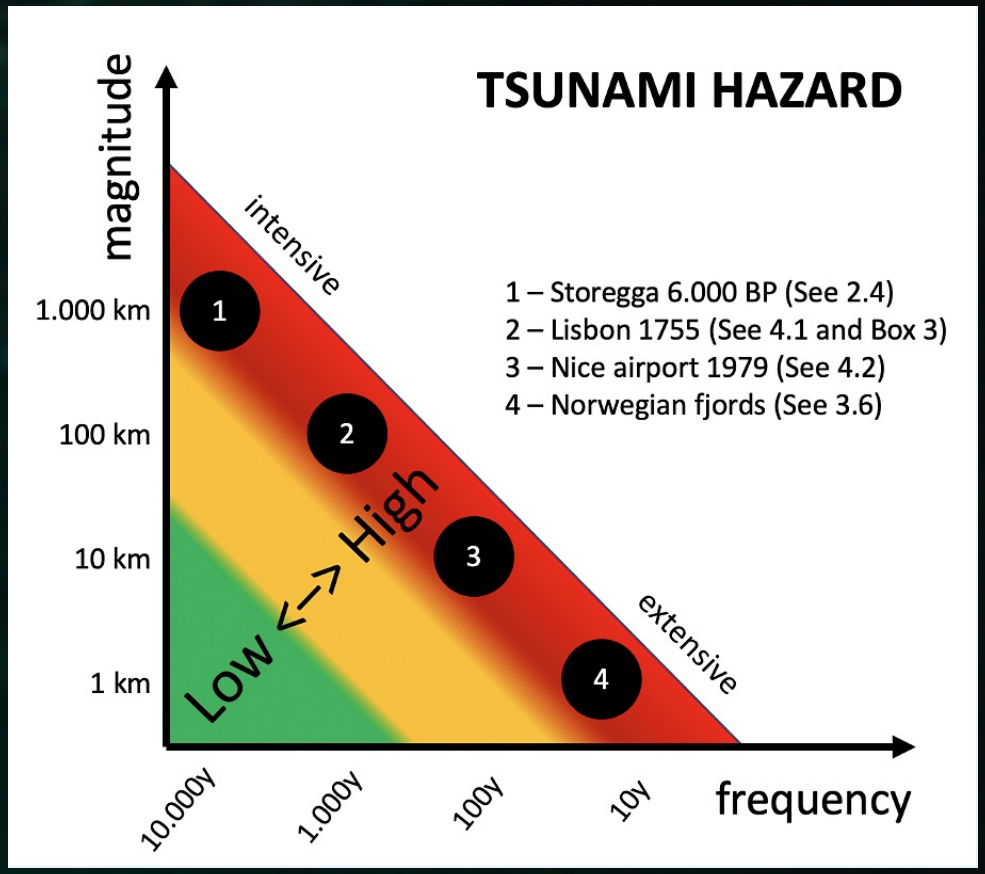

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- Earthquakes
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- Mass movements
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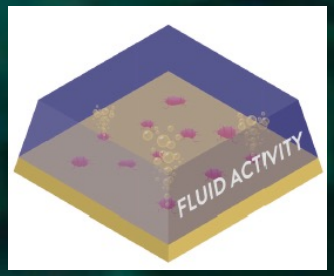
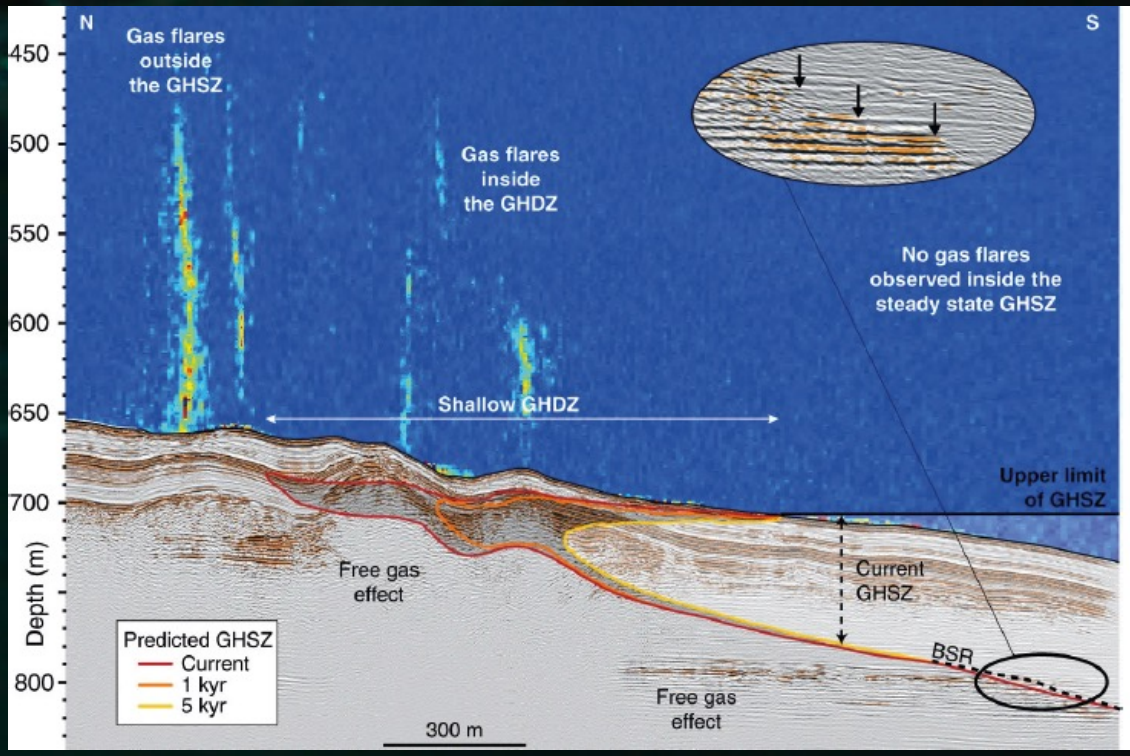
- Fluid activity




# What Types of Hazards Are We Facing on Our Shores?

- Earthquakes
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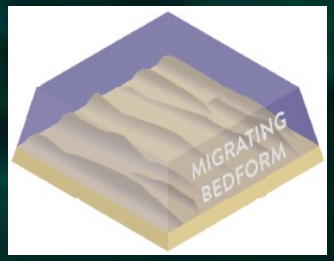
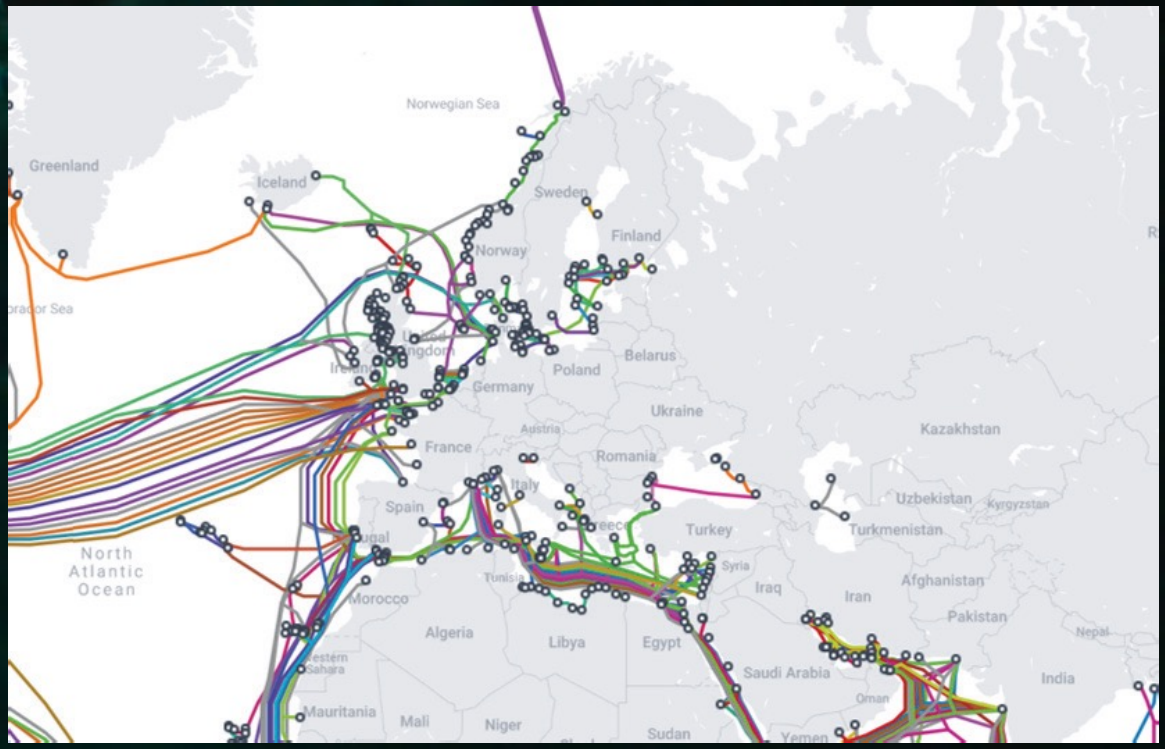
- Migrating bedforms



# What Types of Hazards Are We Facing on Our Shores?

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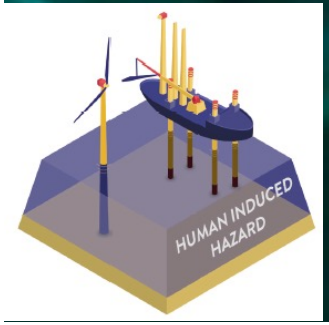
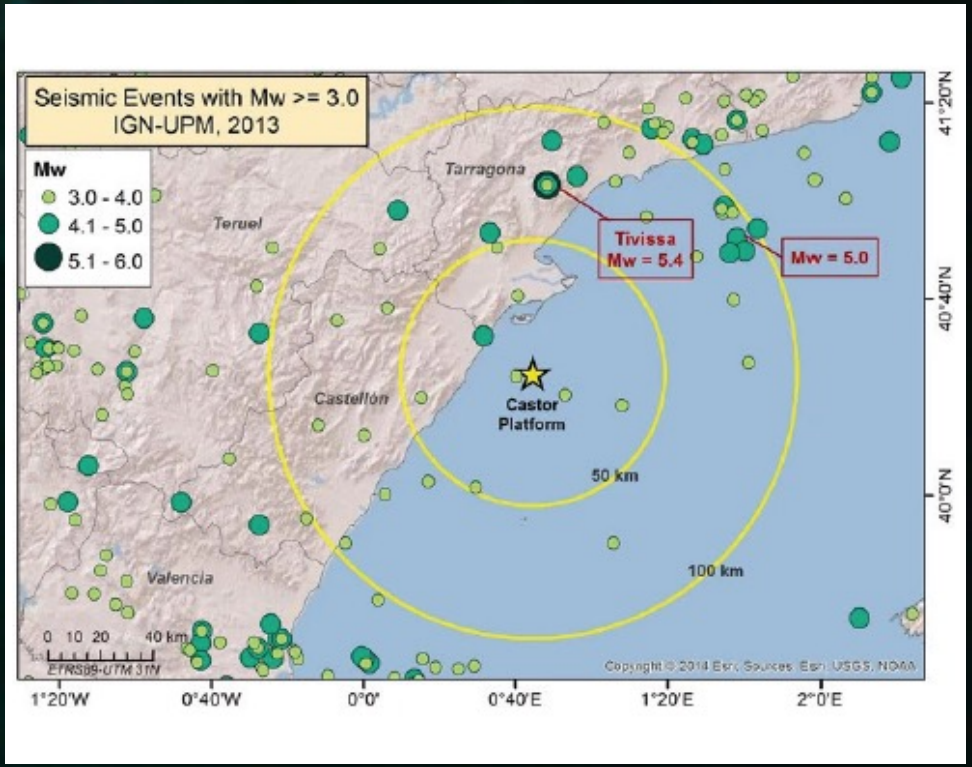
- Human induced and technological hazards



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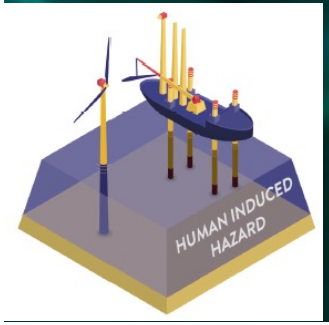


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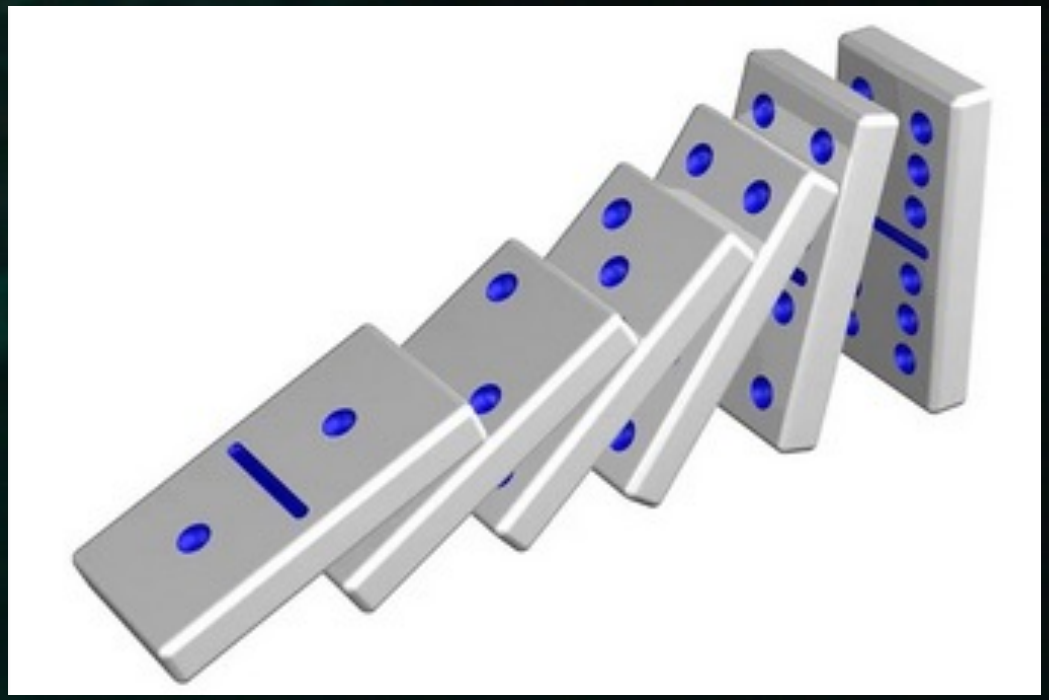

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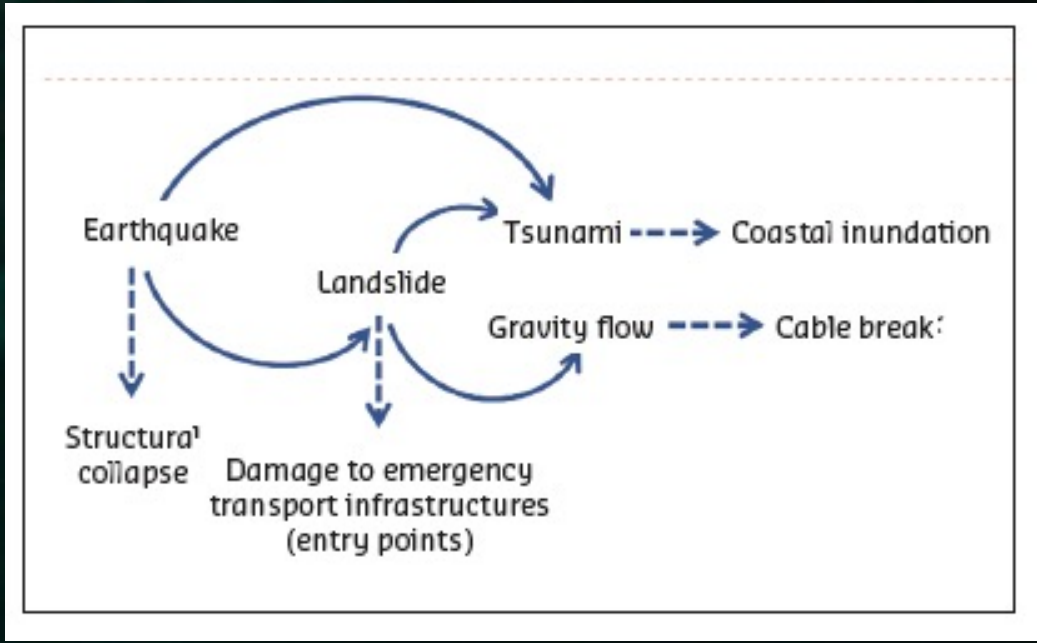

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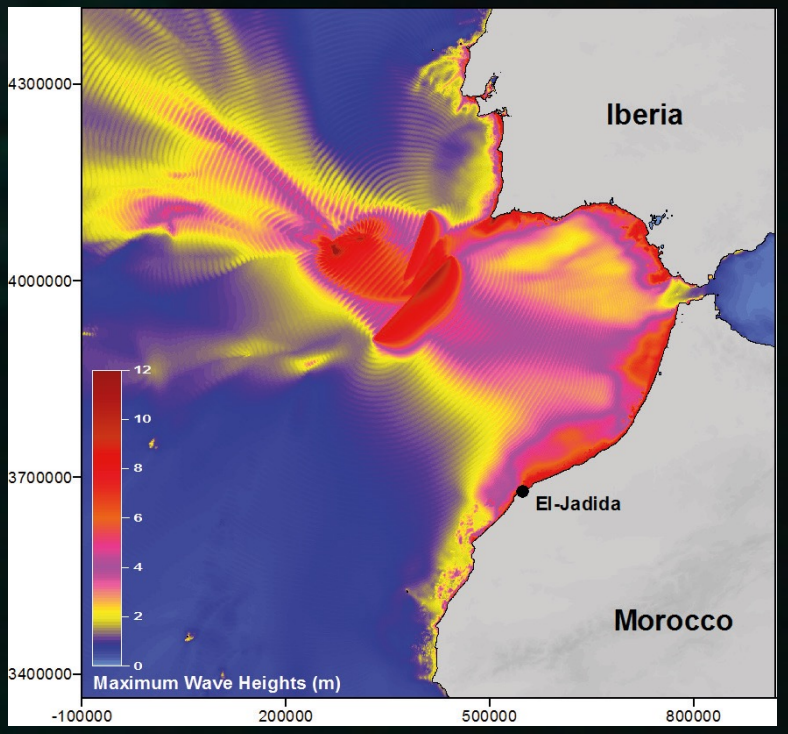

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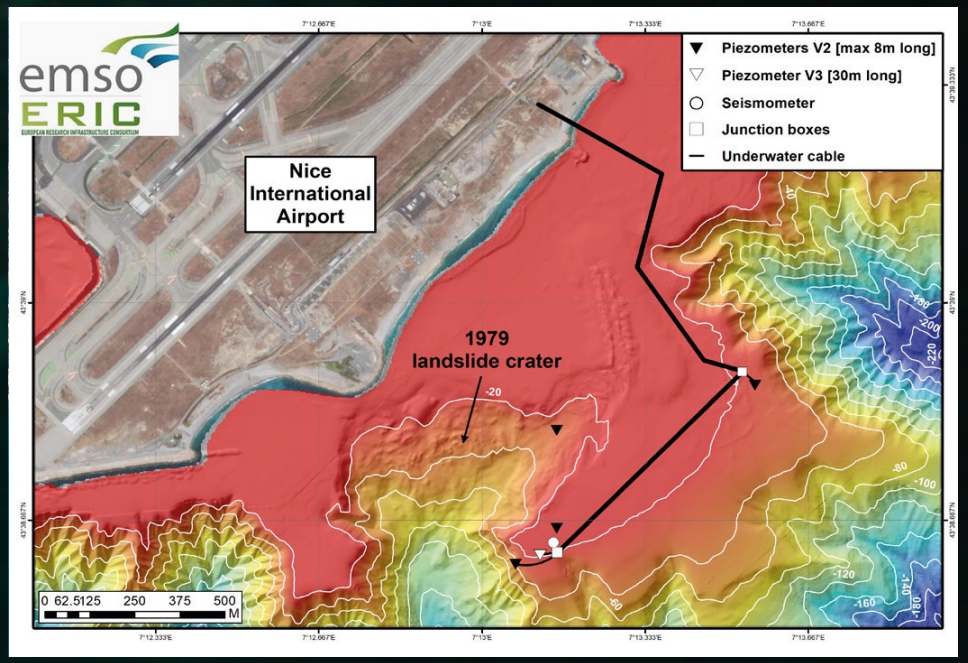

# The Seafloor Stores All Hazard Information

*Seafloor drilling to extract samples and drill cores.*

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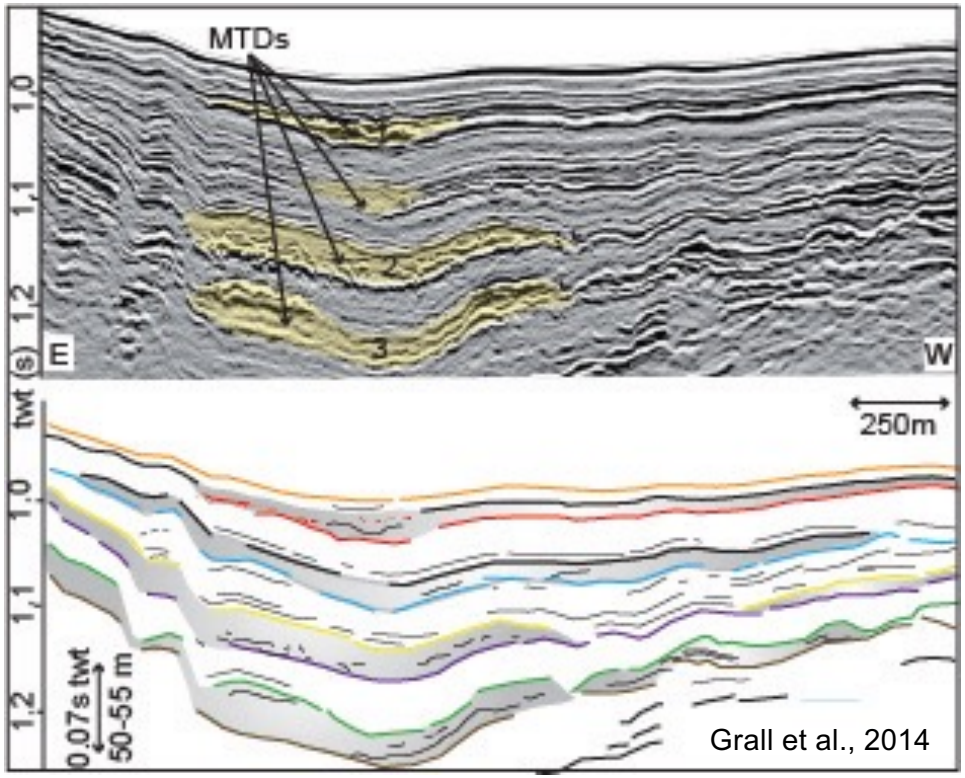


*Mass transport deposits identified in seismic data.*

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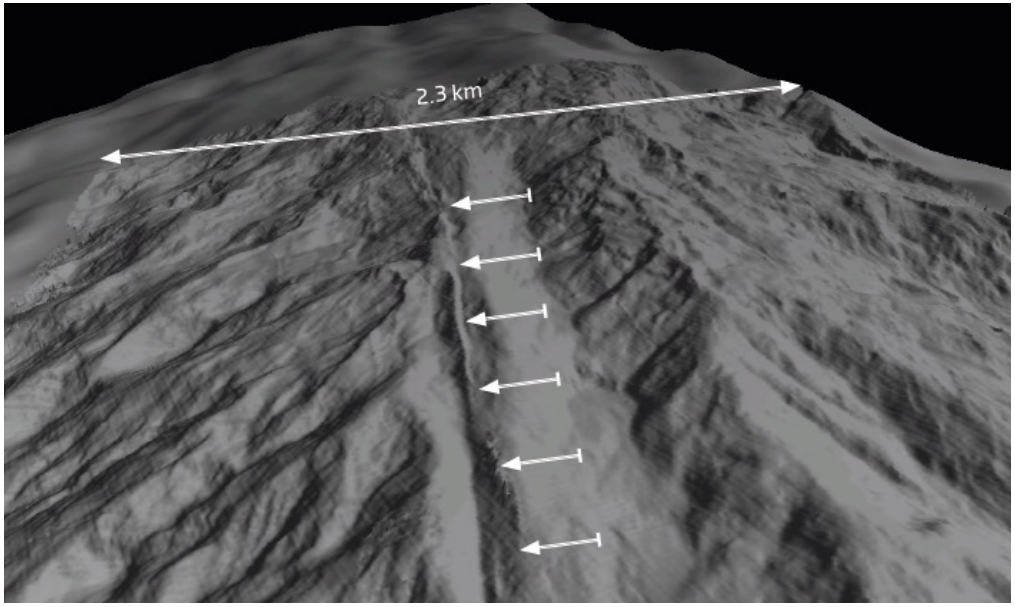
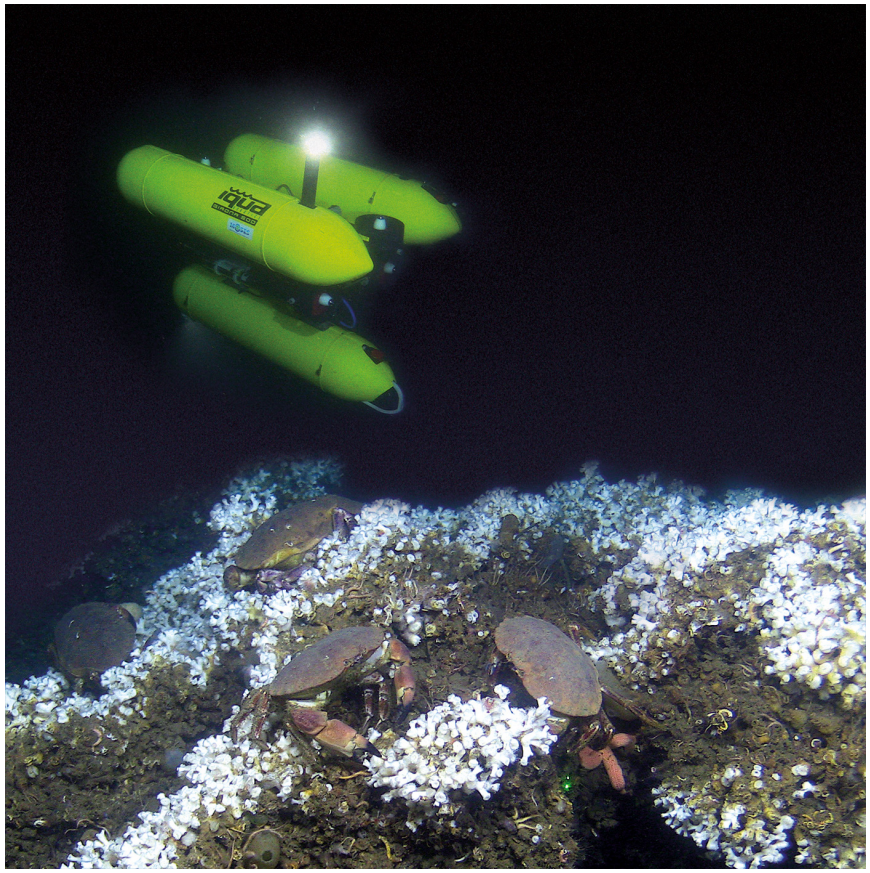



*High-resolution seafloor map revealing a slipping fault on the flank of Mt Etna.*



*An autonomous underwater vehicle (AUV) flying above the seafloor.*

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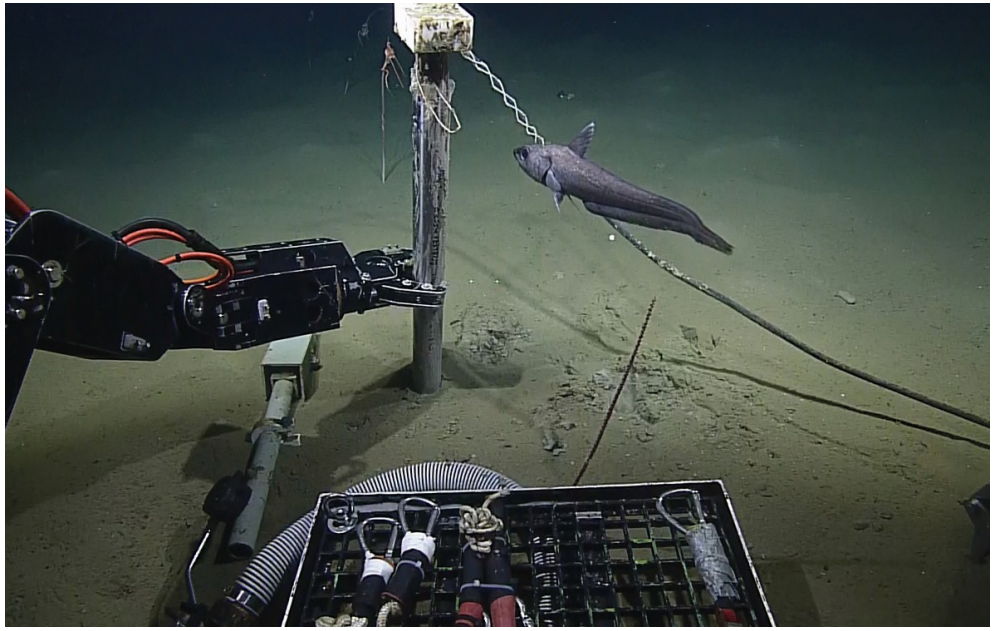
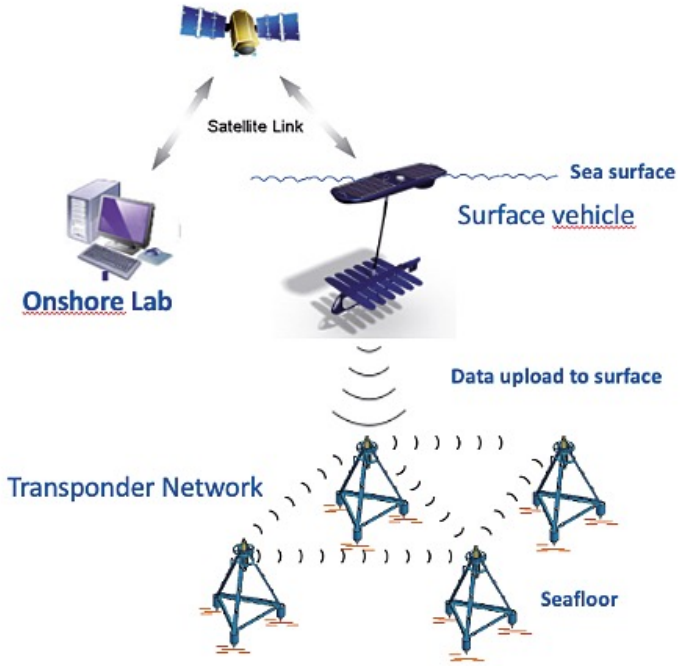


*Putting sensors into the seafloor to measure physical properties of the subsurface.*




*Seafloor monitoring networks connect to satellites and surface vehicles to monitor earthquakes and seafloor deformation.*

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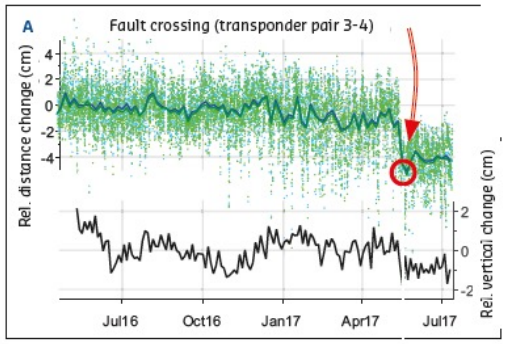
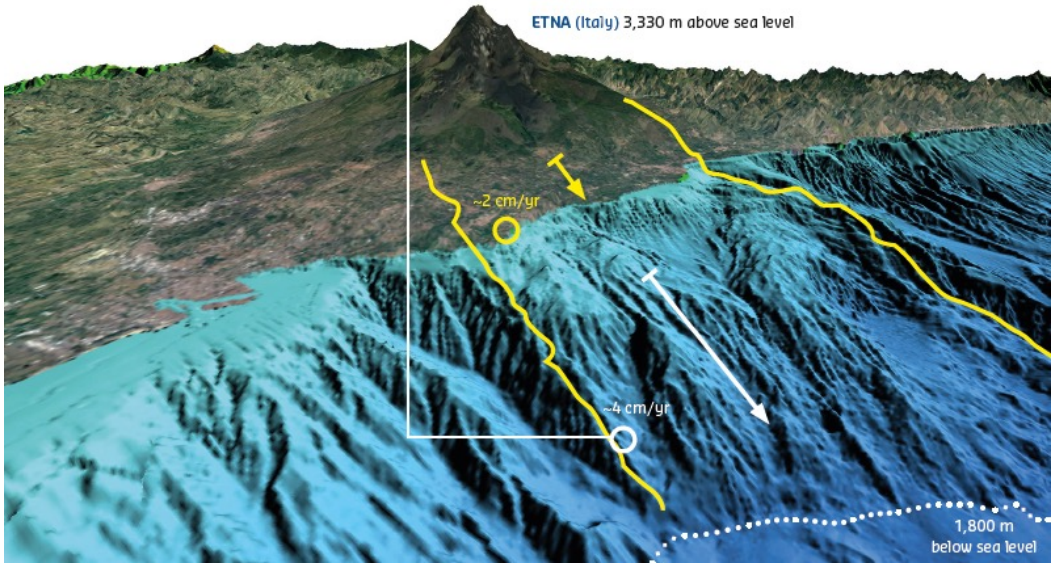
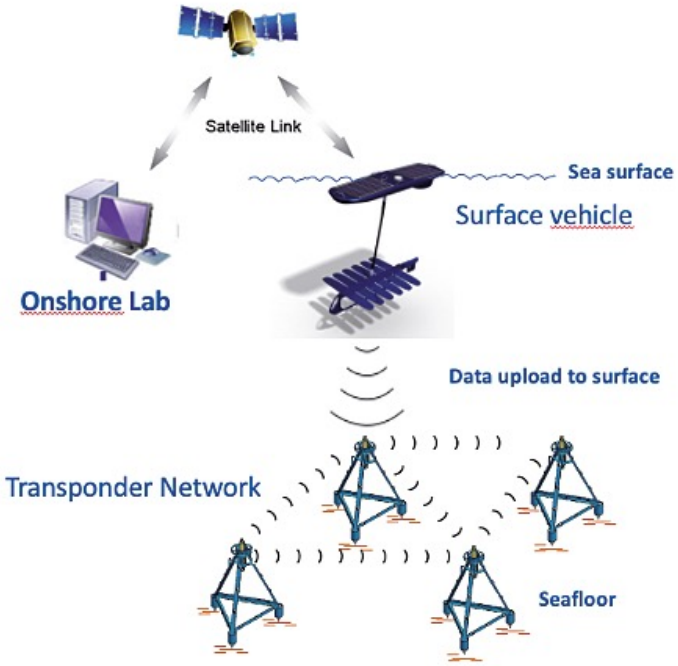
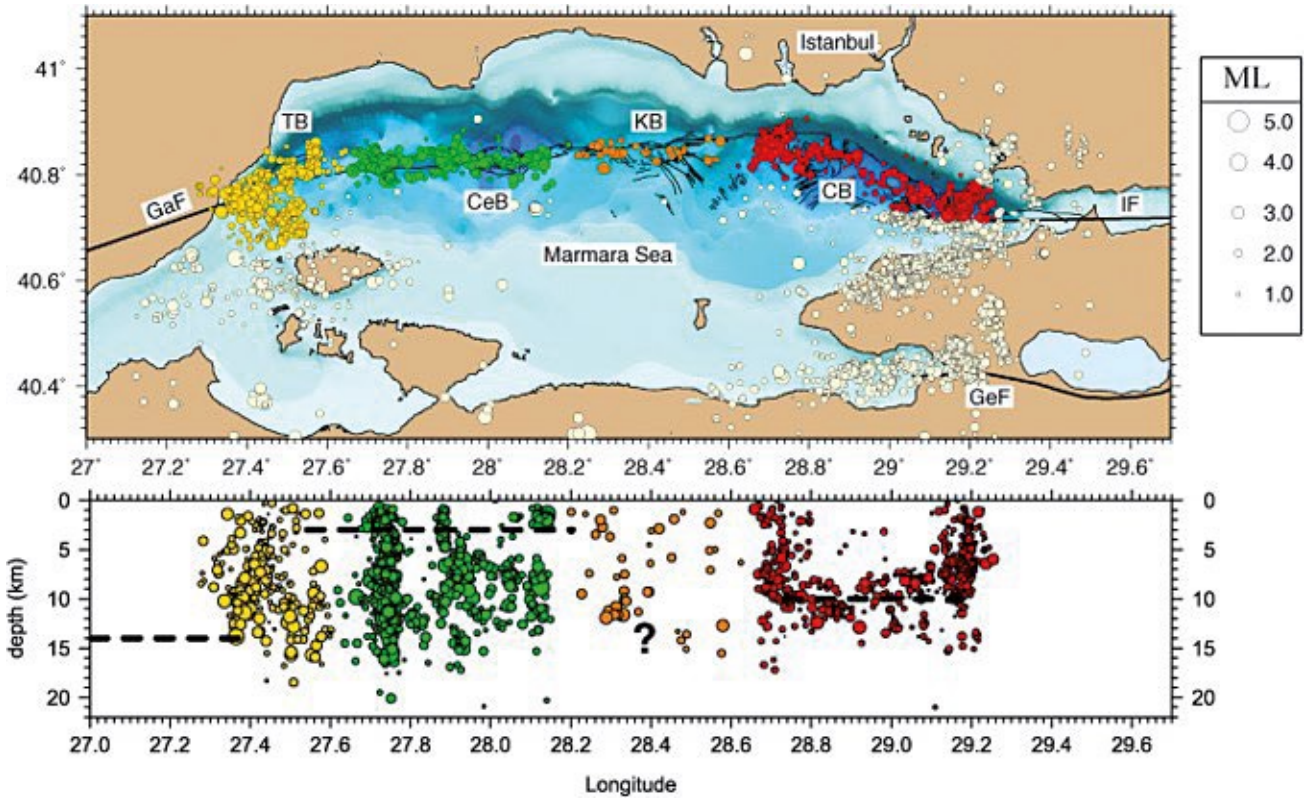


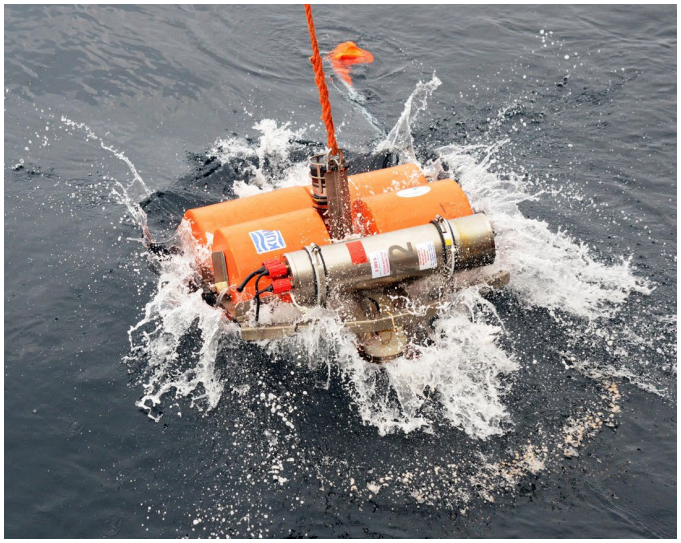




*Detection of a 4 cm movement downslope on the flank of Mount Etna in Sicily.*

# The Seafloor Stores All Hazard Information



*Ocean Bottom Seismometers detect earthquakes at high resolution and reveal segmentation of fault zones.*

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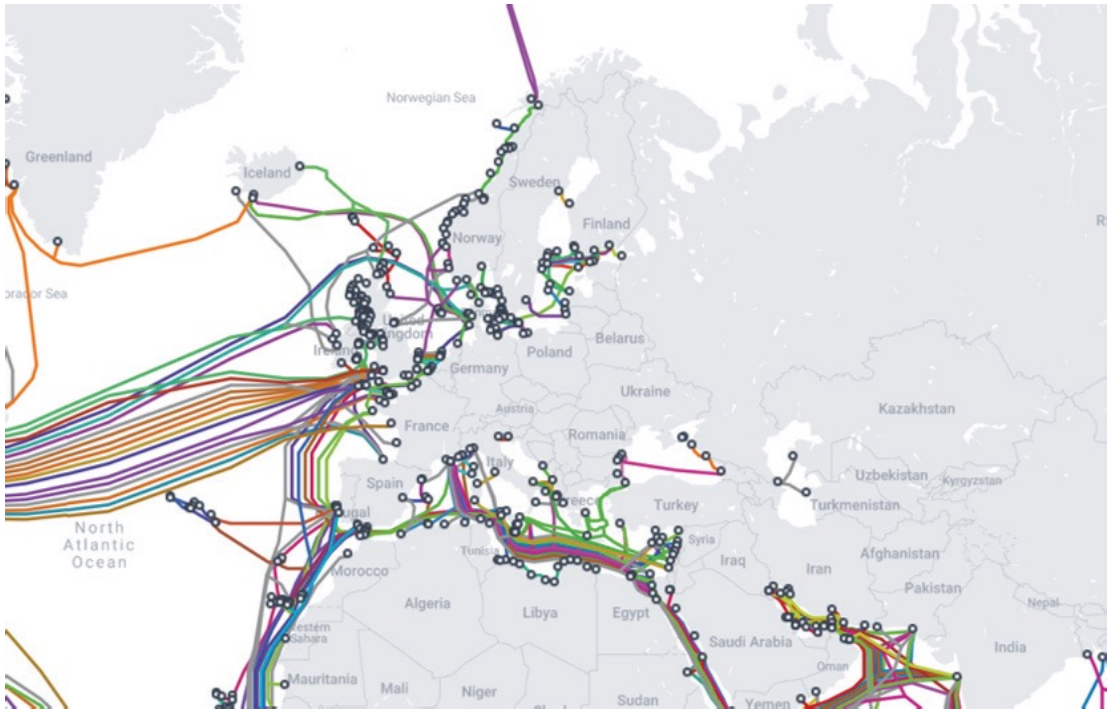
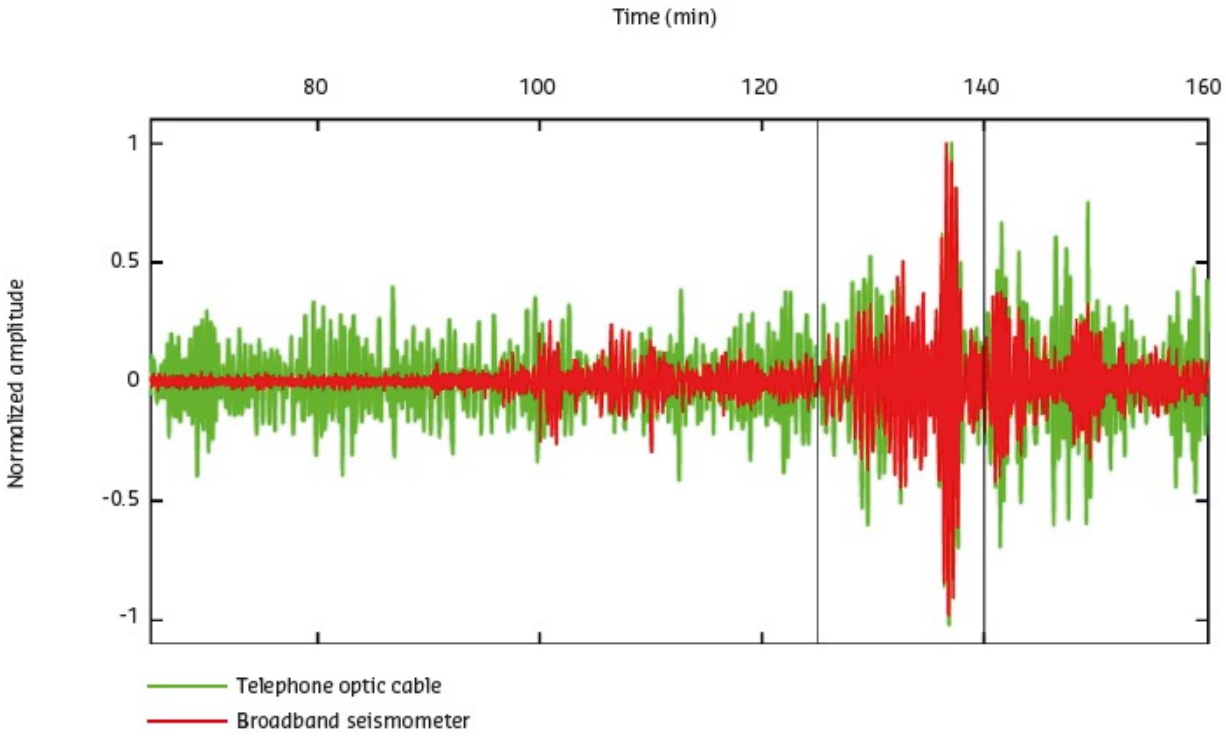



*Employ existing infrastructure for civilian dual use, e.g. use telecommunication cables as SMART sensors.*

# The Seafloor Stores All Hazard Information




*Record of an earthquake on a fibre-optic cable (green) and a broadband seismometer (red). The comparison shows the good phase correspondence between the two sensors.*

# Recommendations

European MARINE BOARD
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## Implement hazards in policies to advance mitigation

## Harvest seafloor information

# Recommendations

European MARINE BOARD
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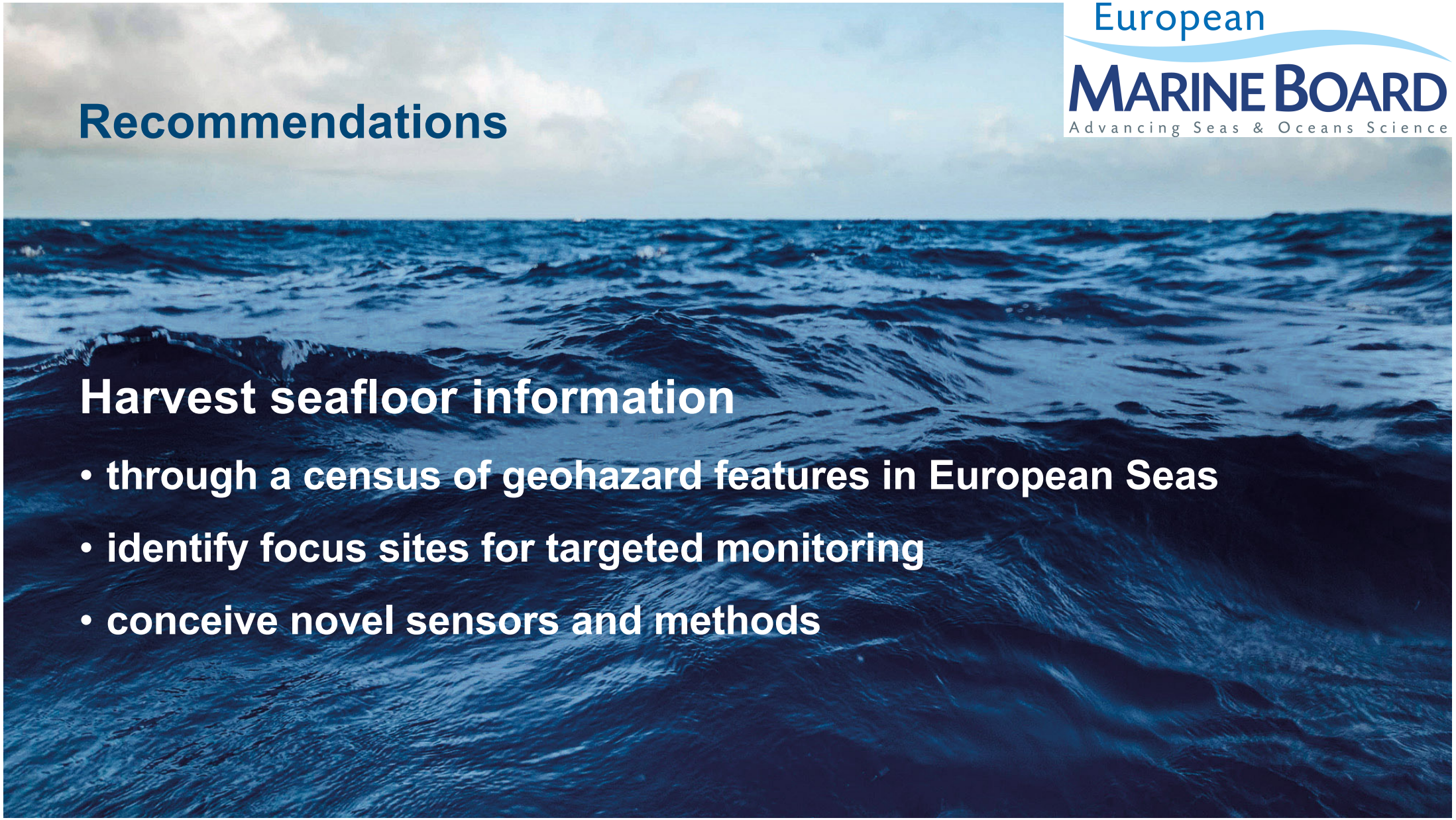
## Implement hazards in policies to advance mitigation

- adapt risk mitigation strategies at local to (trans-) national levels
- increase awareness among public authorities and communities
- model potential impacts on coastal and marine infrastructures



# Recommendations

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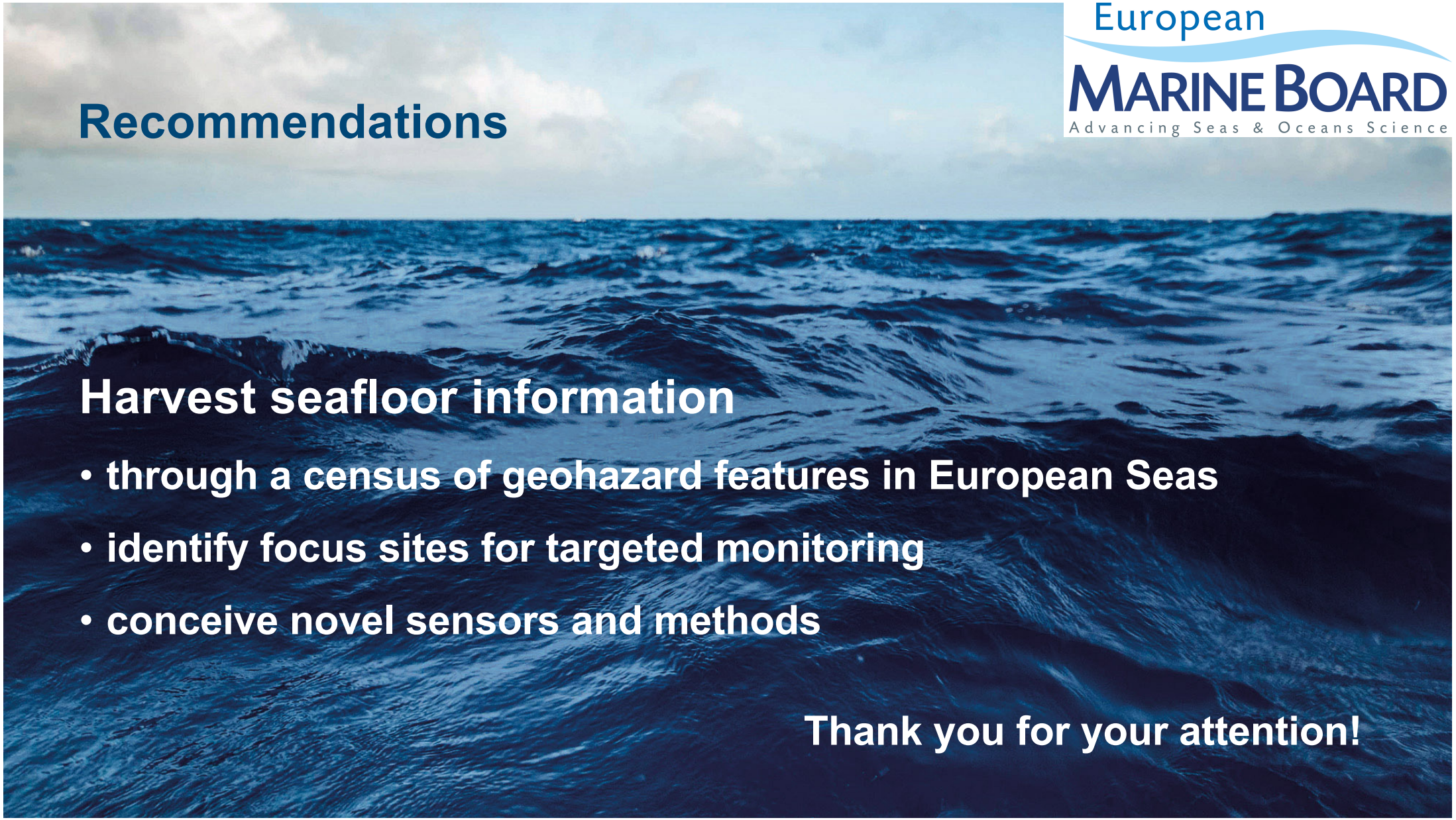
## Harvest seafloor information

- through a census of geohazard features in European Seas
- identify focus sites for targeted monitoring
- conceive novel sensors and methods



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**Thank you for your attention!**