Hazard identification for cable routes using sub-bottom profiler, multi-beam echo sounder and backscatter data

Dirk Hellmann
Fugro OSAE GmbH, Germany

Contact

Address Fugro OSAE GmbH
Fahrenheitstrasse 7
28359 Bremen
Germany

E-mail d.hellmann@fugro.com

Website www.fosae.de, www.fugro.com

Hazard identification for cable routes using sub-bottom profiler, multi-beam echo sounder and backscatter data

Dirk Hellmann ♦ Geology and Geophysics ♦ Fugro OSAE GmbH ♦ Bremen ♦ Germany

Contents

Download: www.innomar.com/seabed-acoustics-2015.php

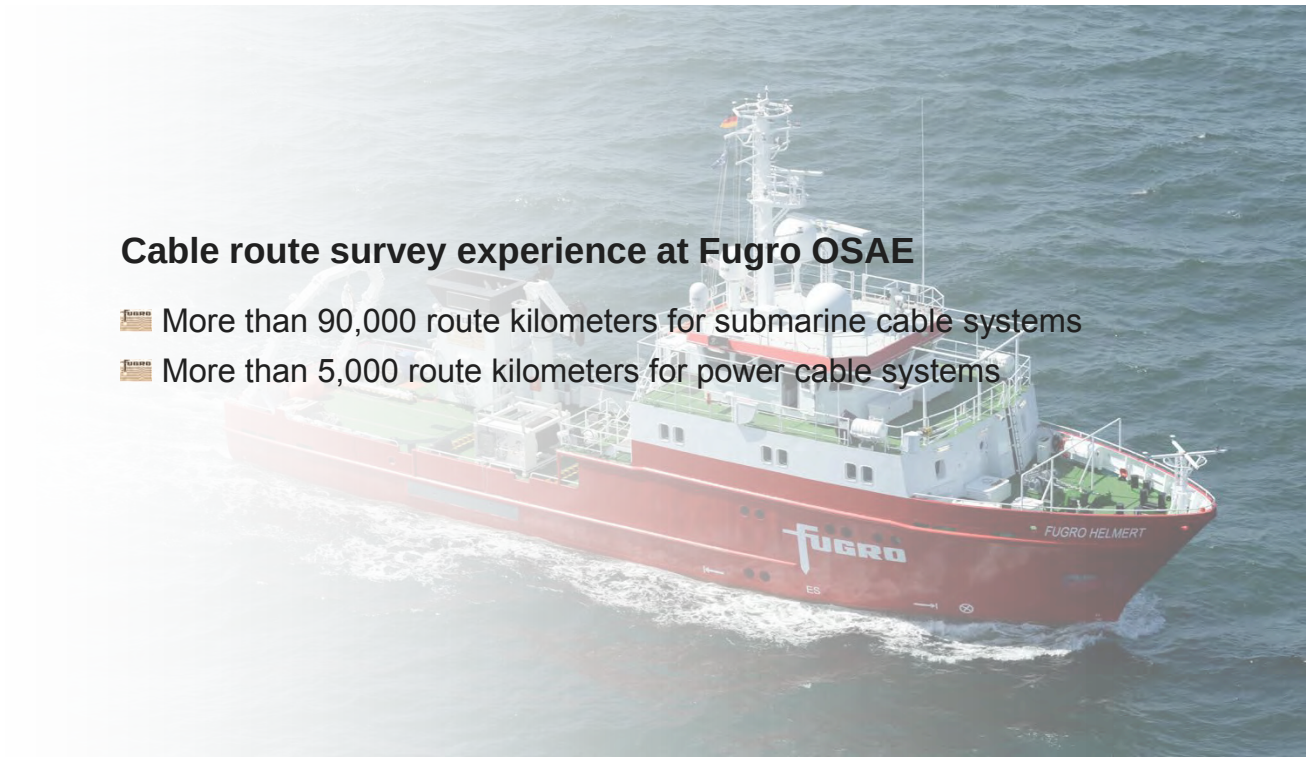
Company profile

Offshore survey services of Fugro OSAE

- Cable route surveys
- Hydrographic surveys
- Cable and pipeline inspection
- Site surveys, e.g. for offshore installations like windfarms
- Desktop studies

Fugro OSAE – Vessels

Offshore survey services of Fugro OSAE



Hazards and their role in cable and pipeline route planning

The goal of cable route planning and survey activities

The route planning and survey activities aim to find the **best route**:

- Feasible
- Short
- Safe

Defined by the **constraints** along the route:

- Conditions: Water depths, seabed lithology, oceanographic, meteorological, political
- Usages: Offshore activities and installations (e.g. fishing, shipping, pipelines and cables, dredging and dumping, oil & gas, offshore wind, etc.)
- Hazards: Natural and man-made (slopes, slumps and slides, fishing, shipping, wrecks, UXO)

The goal of cable route planning and survey activities

The route planning and survey activities aim to find the **best route**:

- Feasible
- Short
- Safe

Defined by the **constraints** along the route:

- Conditions: Water depths, seabed lithology, oceanographic, meteorological, political
- Usages: Offshore activities and installations (e.g. fishing, shipping, pipelines and cables, dredging and dumping, oil & gas, offshore wind, etc.)
- Hazards: Natural and man-made (slopes, slumps and slides, fishing, shipping, wrecks, UXO)

Acoustic methods are best suited to identify many hazards and conditions.

Acoustic survey methods and their capability to identify hazards

Natural hazards for cables and pipelines

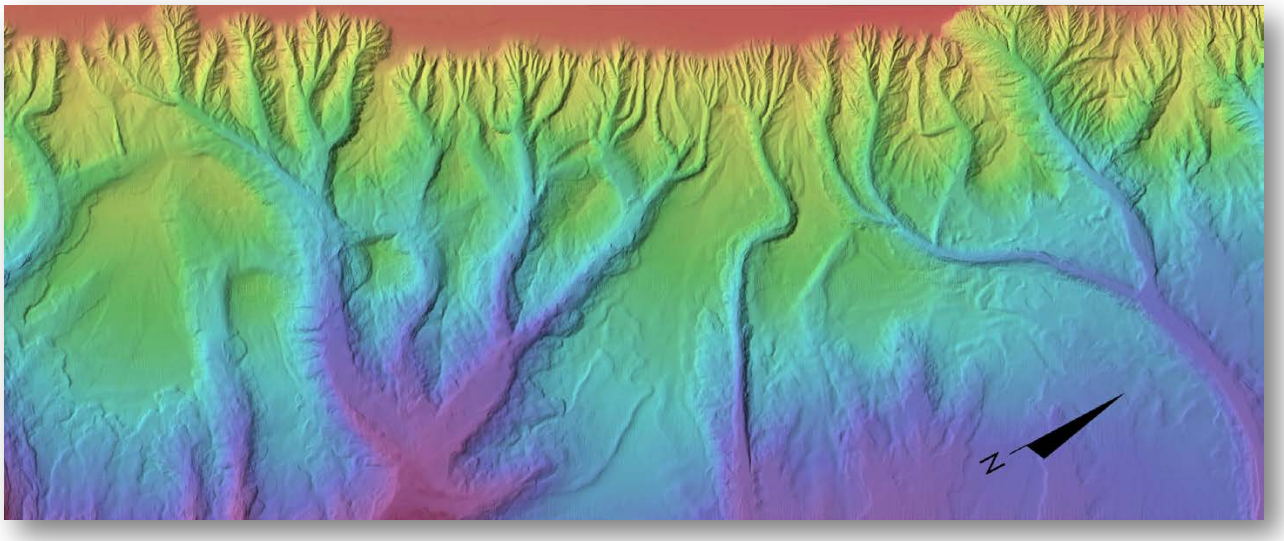
Hazards are linked to different causes and settings:

Geomorphology: Mass movements, i.e. slumps, slides, debris flows and turbidity currents
Steep slopes
Trigger: Submarine earthquakes, volcanic eruptions, extreme weather

Geology: Glacial till and boulders
Hard layers
Pockmarks and shallow gas

Geography: Iceberg scars

Geomorphological Hazards: Bathymetry and backscatter



Multibeam bathymetry Size of area approx. 83 x 34 km
Water depth range 100 – 2 900 m

Geomorphological Hazards: Bathymetry and backscatter

Multibeam backscatter Size of area approx. 83 x 34 km
Water depth range 100 – 2 900 m

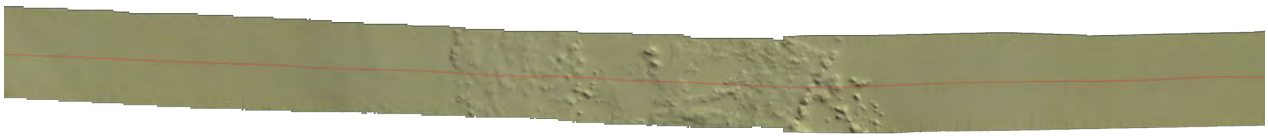
Natural hazards for cables and pipelines

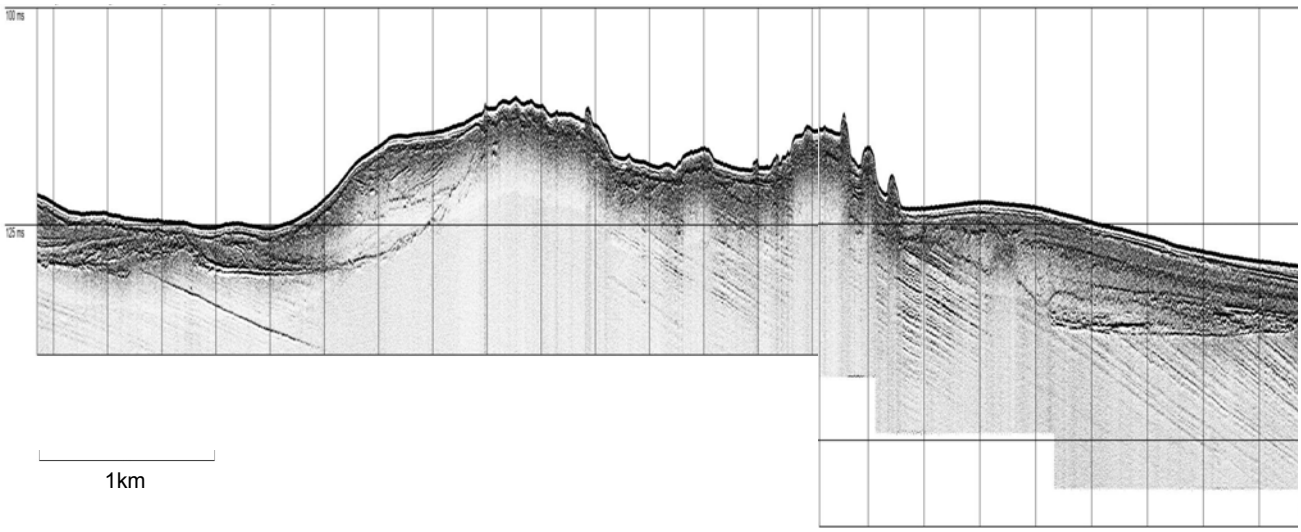
Hazards are linked to different causes and settings:

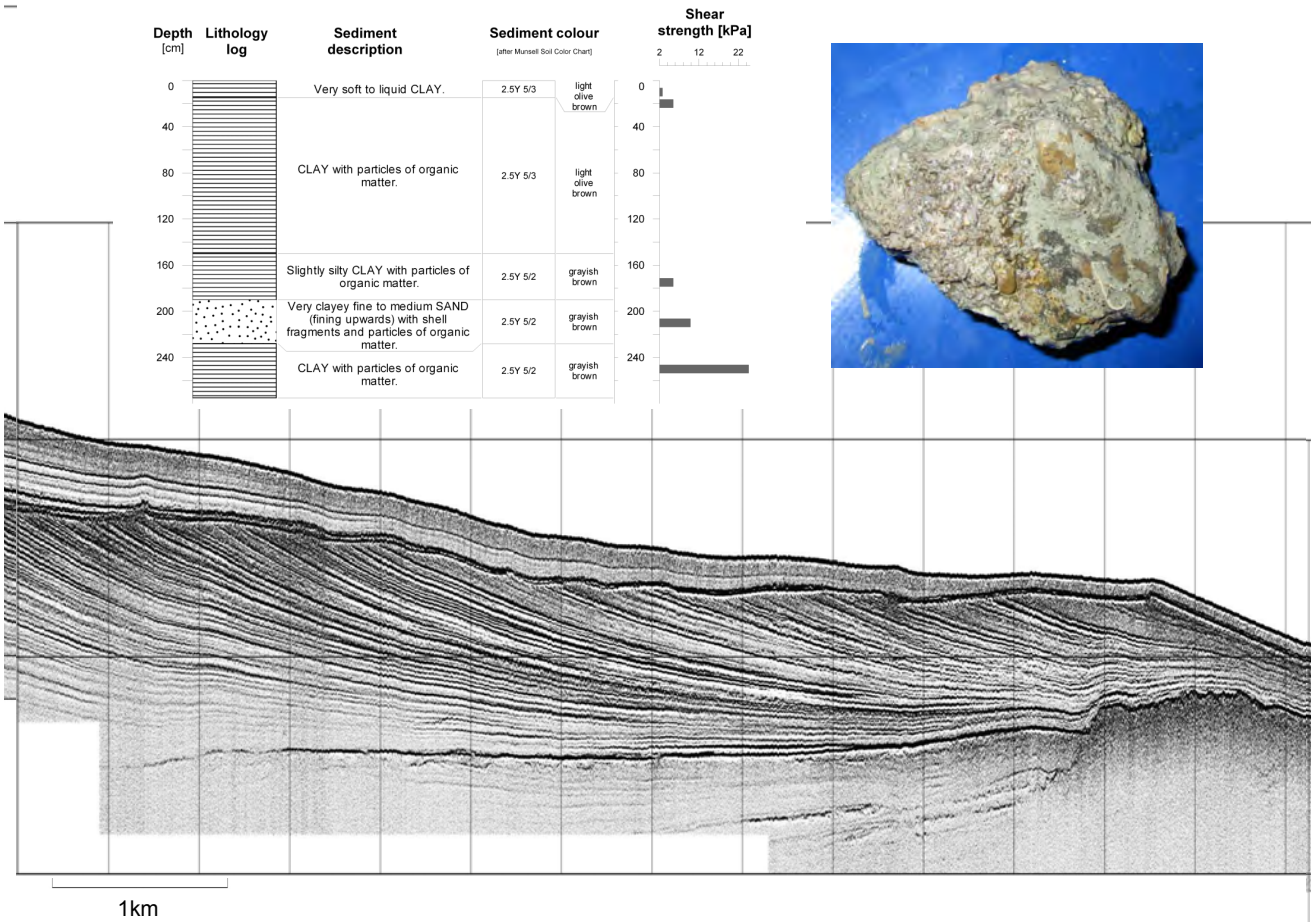
Geomorphology: Mass movements, i.e. slumps, slides, debris flows and turbidity currents
Steep slopes
Trigger: Submarine earthquakes, volcanic eruptions, extreme weather

Geology: Glacial till and boulders
Hard layers
Pockmarks and shallow gas

Geography: Iceberg scars




100 ms
125 ms
1km


Depth [cm]
Lithology log
Sediment description
Sediment colour
[after Munsell Soil Color Chart]
Shear strength [kPa]
2
12
22
0
40
80
120
160
200
240
Very soft to liquid CLAY.
2.5Y 5/3
light olive brown
CLAY with particles of organic matter.
2.5Y 5/3
light olive brown
Slightly silty CLAY with particles of organic matter.
2.5Y 5/2
grayish brown
Very clayey fine to medium SAND (fining upwards) with shell fragments and particles of organic matter.
2.5Y 5/2
grayish brown
CLAY with particles of organic matter.
2.5Y 5/2
grayish brown
1km

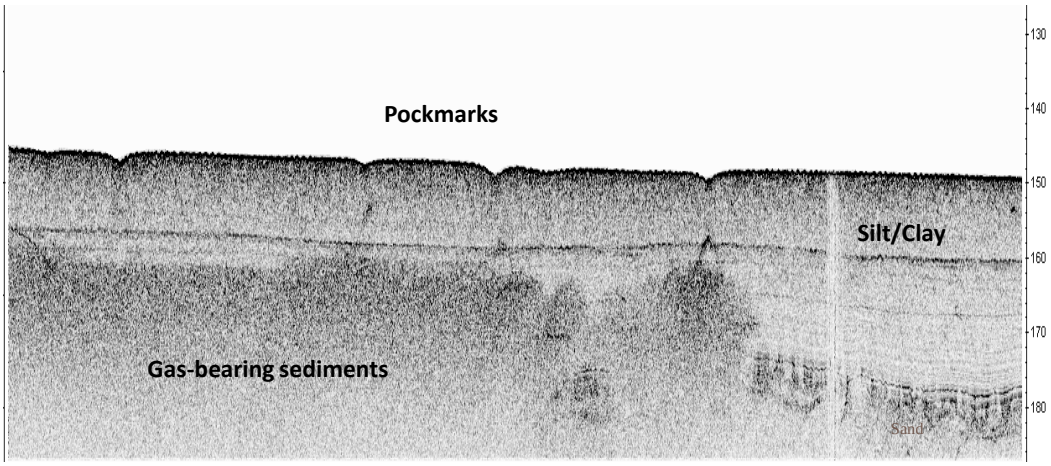
Geological Hazards: Bathymetry and backscatter

Installation Hazards

- Soft gas-bearing sediments reduce the stability of the sea floor
- Potentially steep slopes at pockmarks with large diameter

Operational Hazards

- Low thermal conductivity could pose a hazard for power cables
- Adverse effect of aggressive gases on cable armor



Natural hazards for cables and pipelines

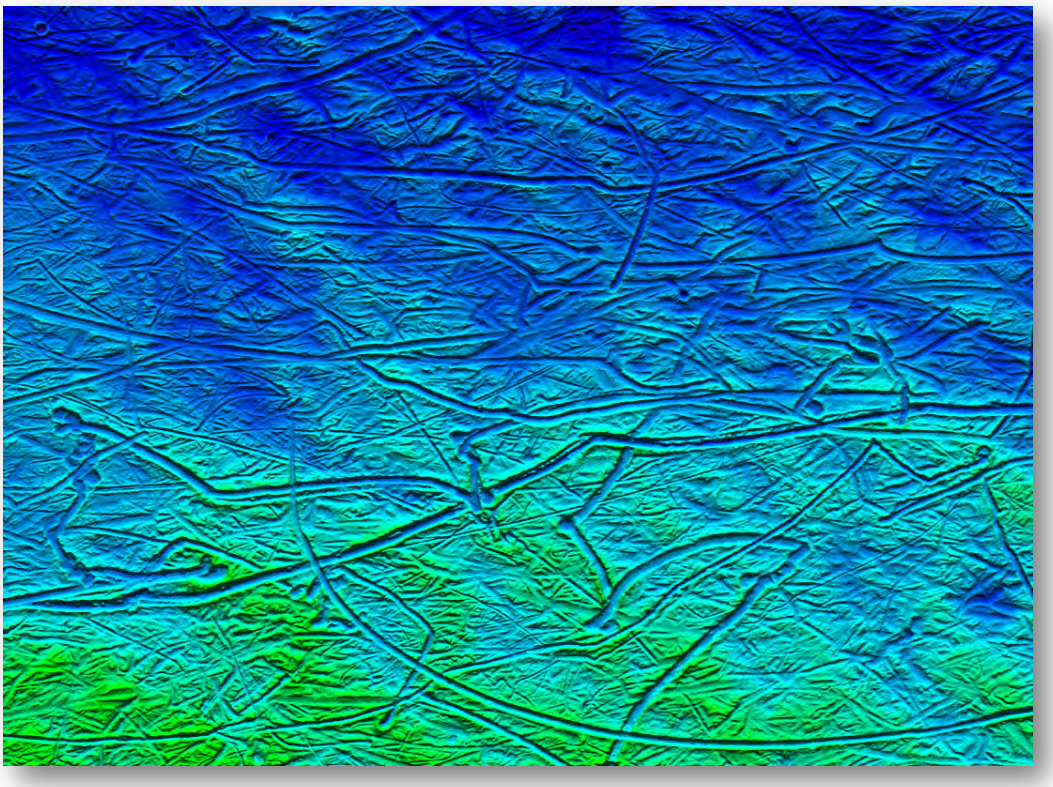
Hazards are linked to different causes and settings:

Geomorphology: Mass movements, i.e. slumps, slides, debris flows and turbidity currents
Steep slopes
Trigger: Submarine earthquakes, volcanic eruptions, extreme weather

Geology: Glacial till and boulders
Hard layers
Pockmarks and shallow gas

Geography: Iceberg scars

Geographical Hazards: Bathymetry and backscatter

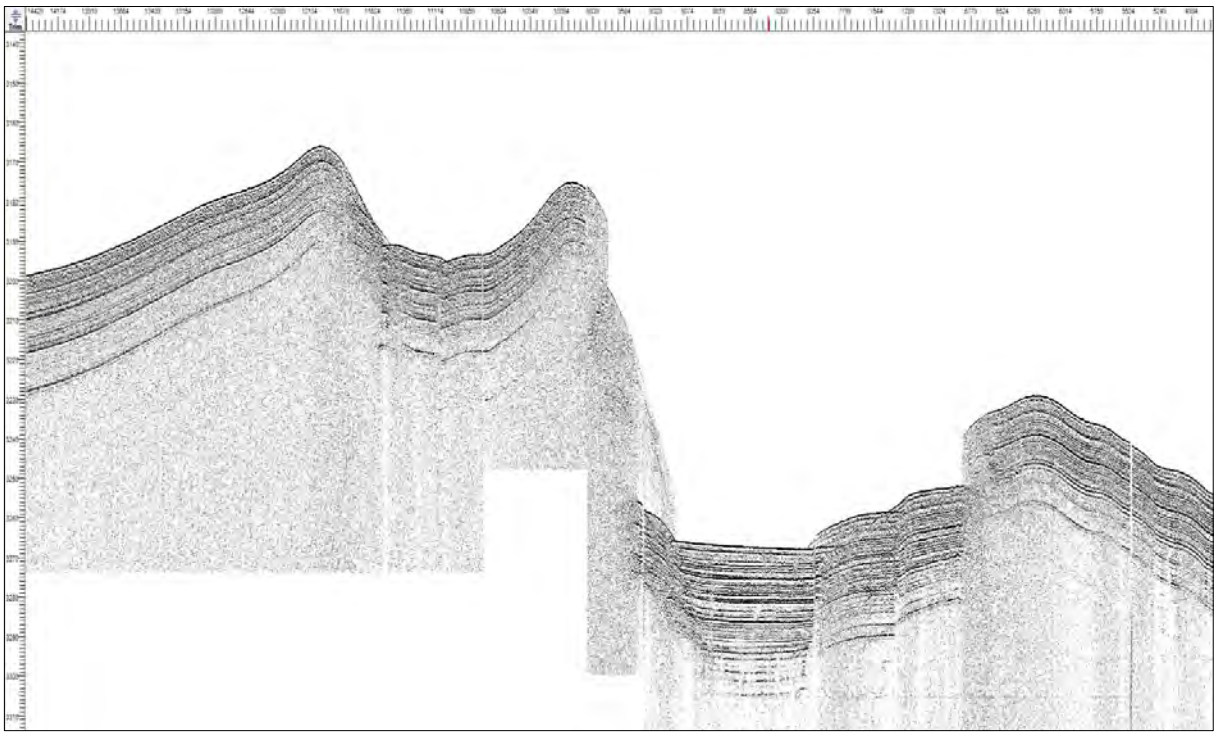


Summary

Summary

- It is essential for the safe installation and operation of subsea cables to understand all hazards along the route
- The typical way to identify natural hazards in the marine environment is the use of acoustic survey methods
- Natural hazards are linked to the geomorphological, geological and geographical settings of the route (in fact most are associated with slope)
- Choosing the right acoustic survey method/tool is important to be able to identify natural hazards
- Nevertheless there are settings where good acoustic data are difficult to obtain

Summary



Thank you!

Questions welcome