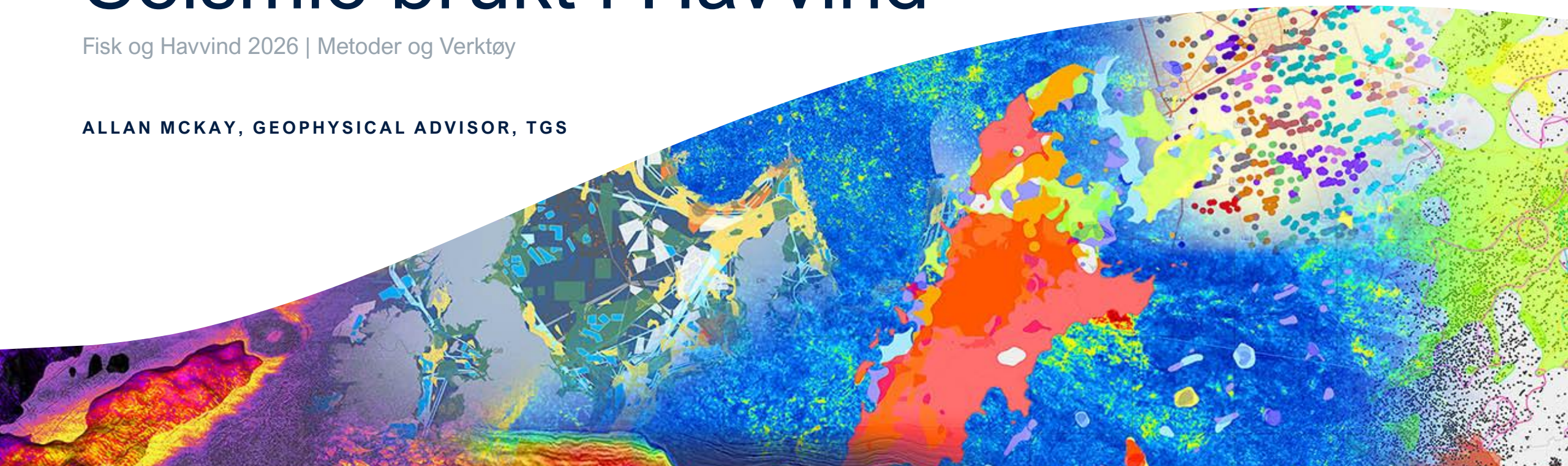




Seismic brukt i Havvind

Fisk og Havvind 2026 | Metoder og Verktøy

ALLAN MCKAY, GEOPHYSICAL ADVISOR, TGS



Outline

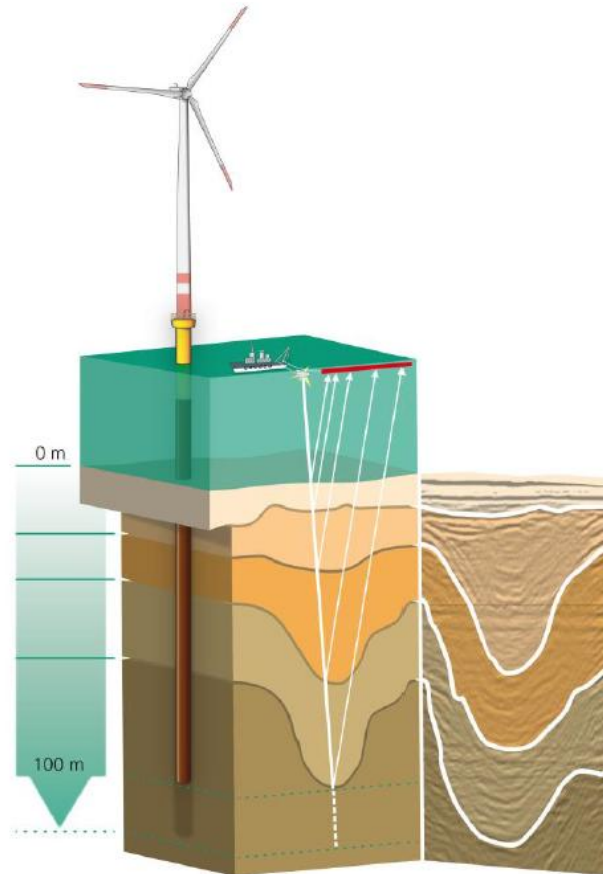
- Introduction
- Survey practicalities
- Data examples
- Time and cost savings
- Summary & closing remarks

Site Characterization Scope & Objectives



Site Characterization Scope & Objectives

To define *seabed* and *subsurface*



1. Framework

e.g. major soil units of interest

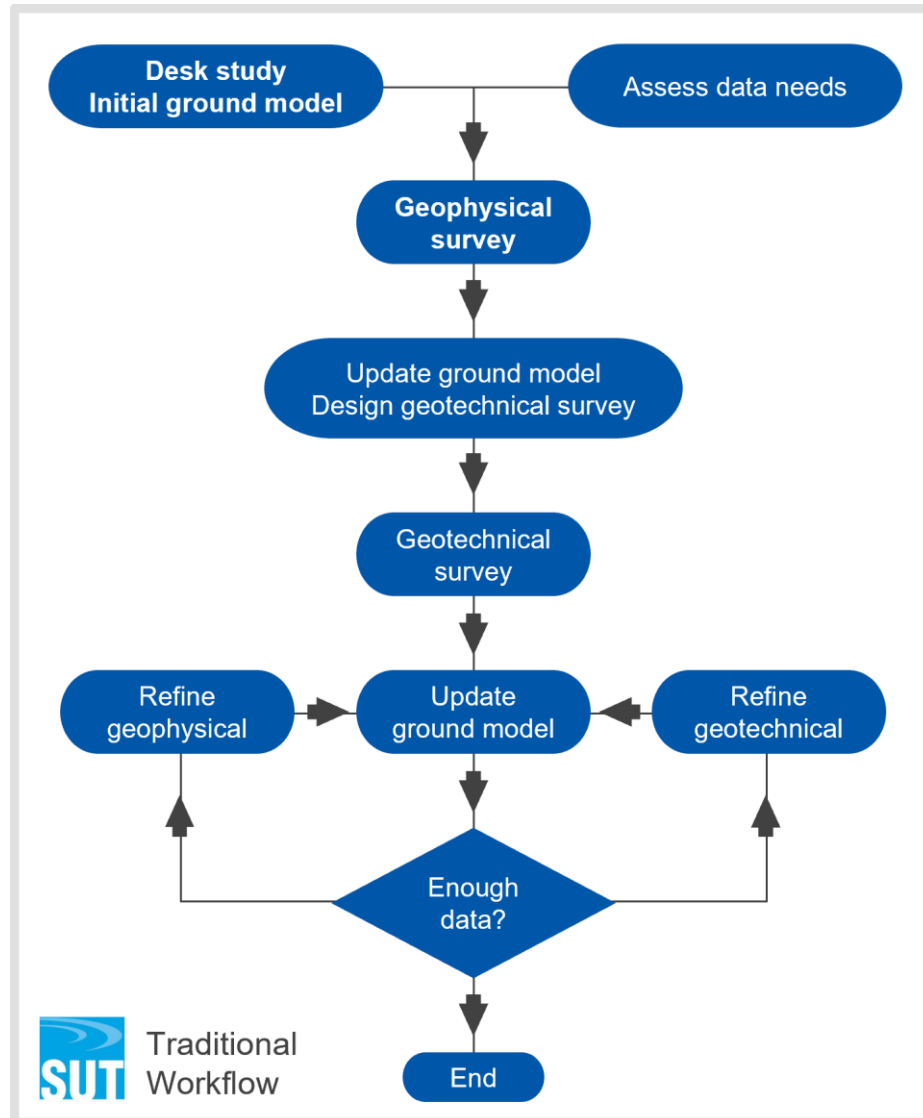
2. Properties

e.g. soil stiffness and strength

3. Hazardous Features

e.g. boulders, gas, faults, wrecks, ...

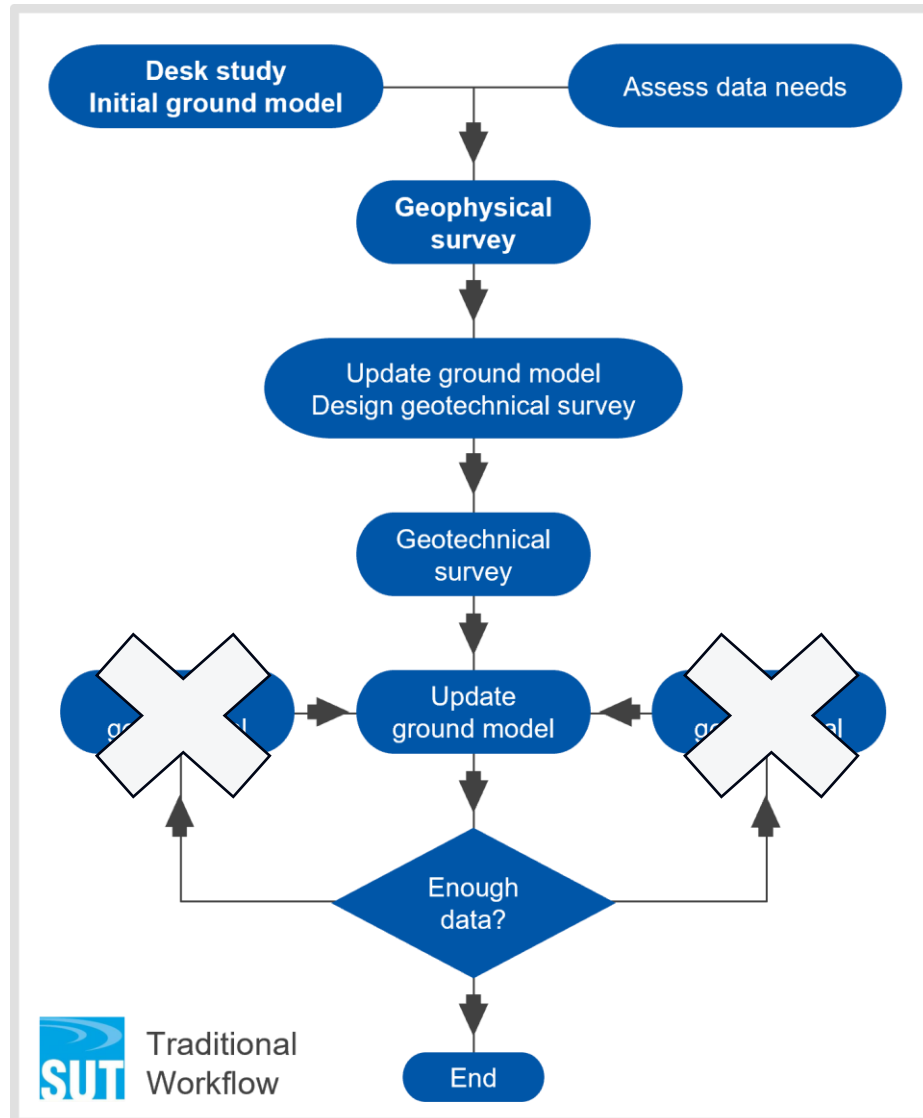
Traditional Site Characterization Process



Key Challenges

- Sub-optimal data acquisition spanning multiple years
- Uncertainty about the spatial variability of geohazards & key subsurface units and properties away from the 2D profiles
- Conservatism in engineering design due to lack of flexibility in the design & placement of infrastructure driving cost

Simplified Site Characterization Process

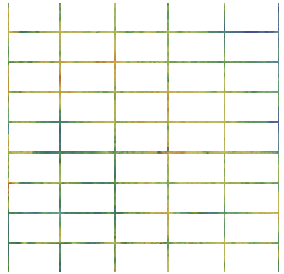


Key Benefits

- Faster Project Time
- Better understanding of Subsurface Variability
- Improved Geohazards detection
- Optimized Infrastructure Placement
- Enable less conservative Engineering Design

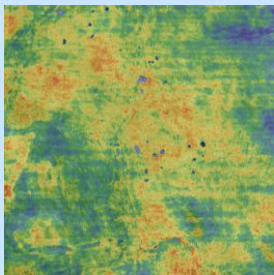
Characterize spatial variability in 3D

Enhanced design flexibility is required with many anchor points,
unchartered territory requires significant de-risking



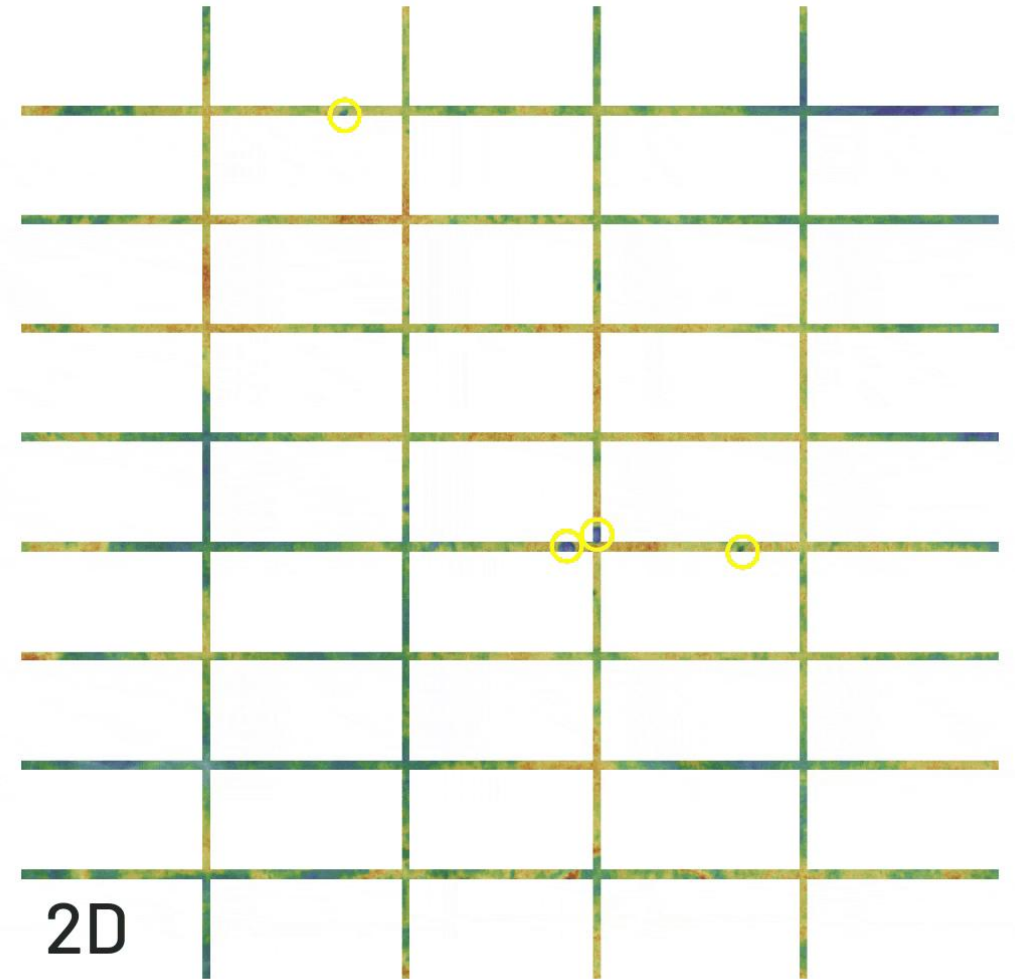
2D provides some insight

Limited understanding of
geohazards with
poor spatial sampling

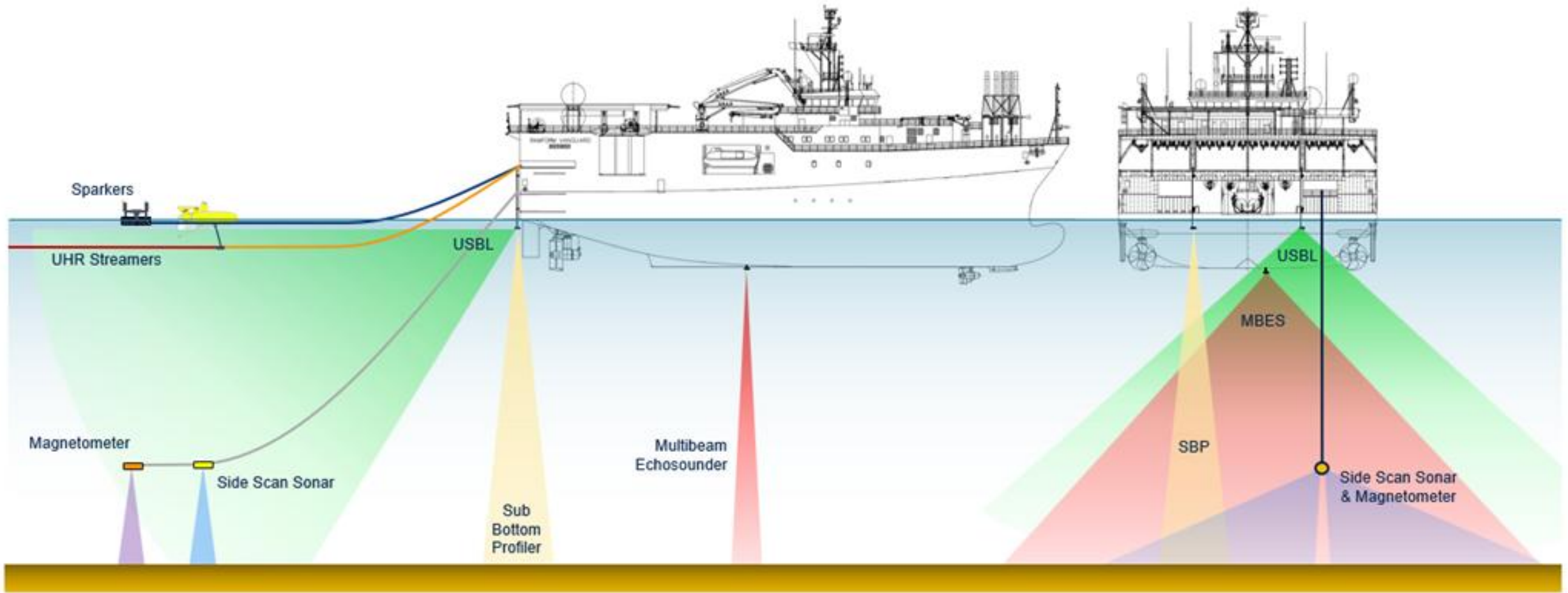


3D provides the full picture

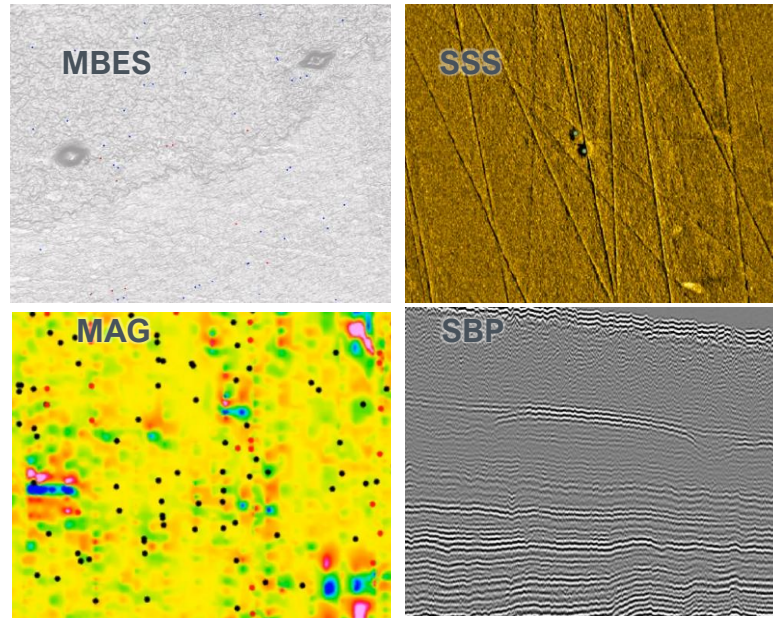
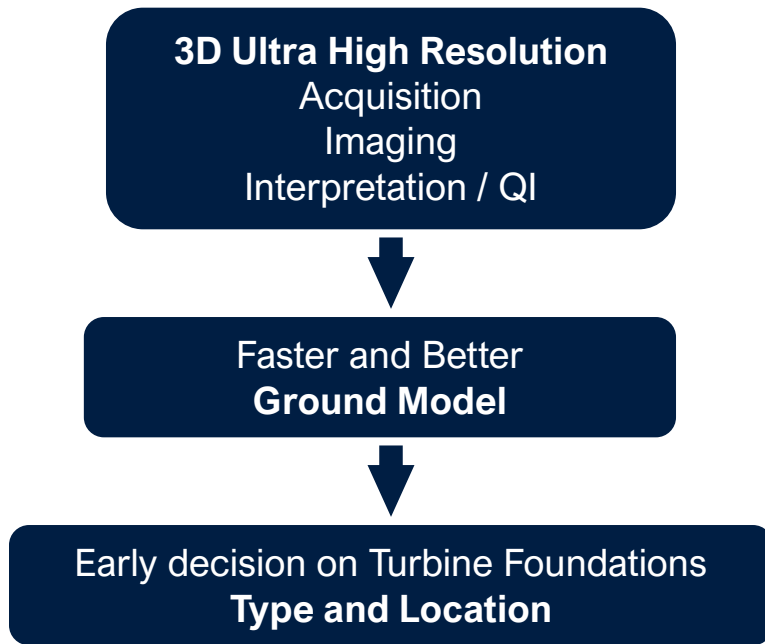
Understand geohazards
earlier and with greater
certainty with UHR3D



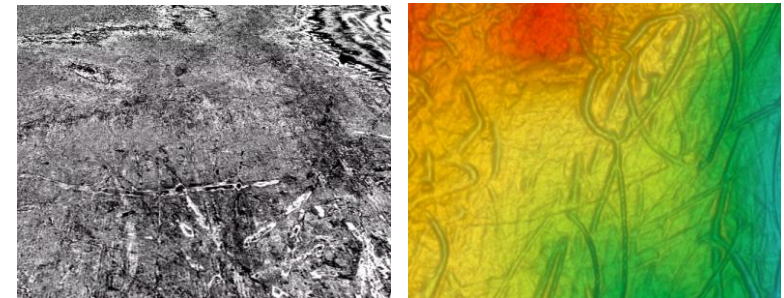
Integrated UHR3D Survey Sketch



Geophysical methods in an integrated UHR3D survey

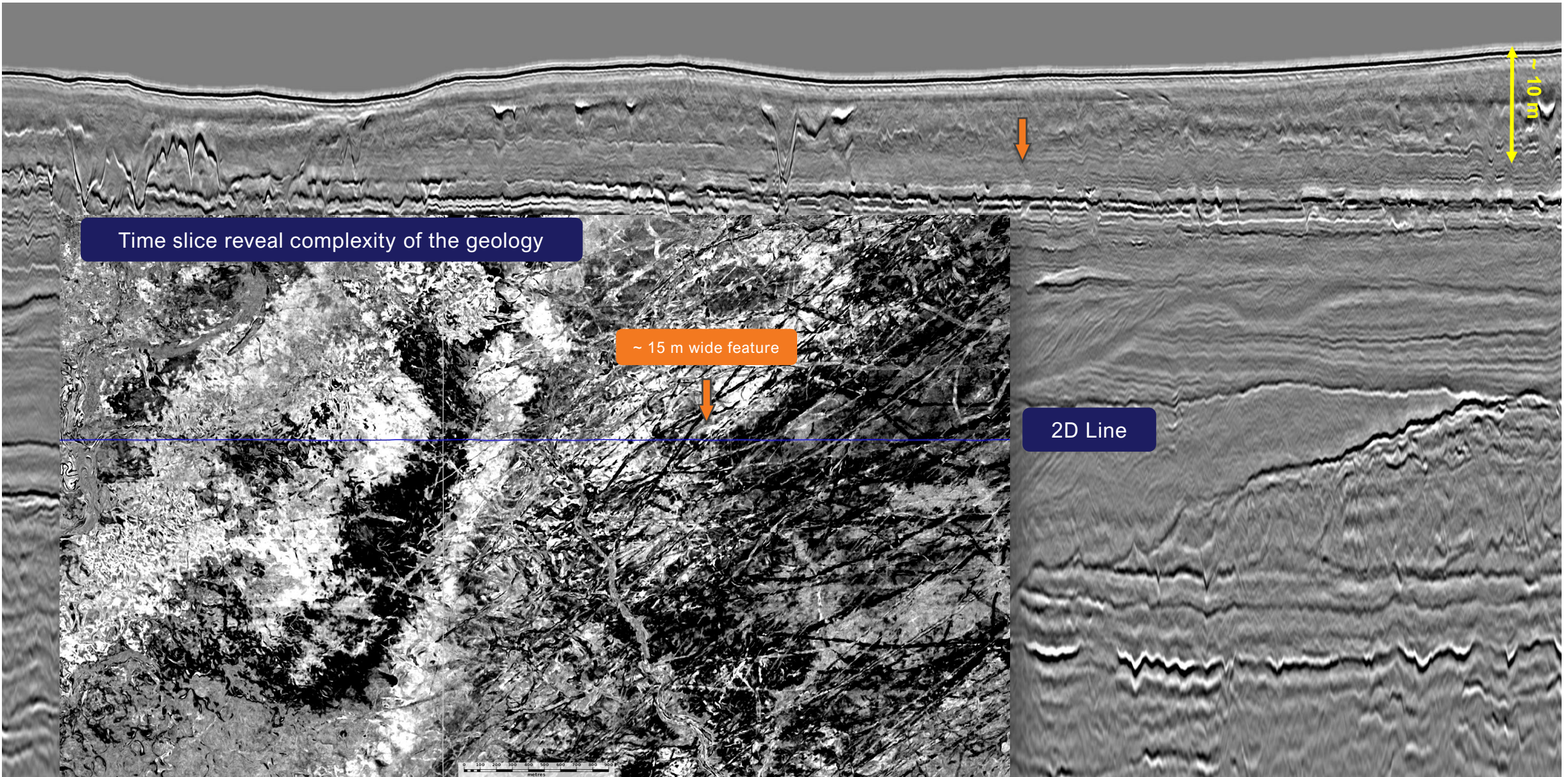


Seabed & Shallow Subsurface



| Sensor | Purpose |
|--------------------------------|---|
| Sparker Sources/ UHR Streamers | 3D Imaging of the subsurface at meter/sub-metre scale |
| Multibeam Echo Sounder (MBES) | Bathymetric mapping of sea-bed depth, morphology and features |
| Side Scan Sonar (SSS) | Mapping of seabed objects and features |
| Sub Bottom Profiler (SBP) | Near-surface 2D imaging at sub-metre scale |
| Magnetometer (MAG) | Detection and mapping of ferrous objects |

UHR3D Data Example



Time slice reveal complexity of the geology

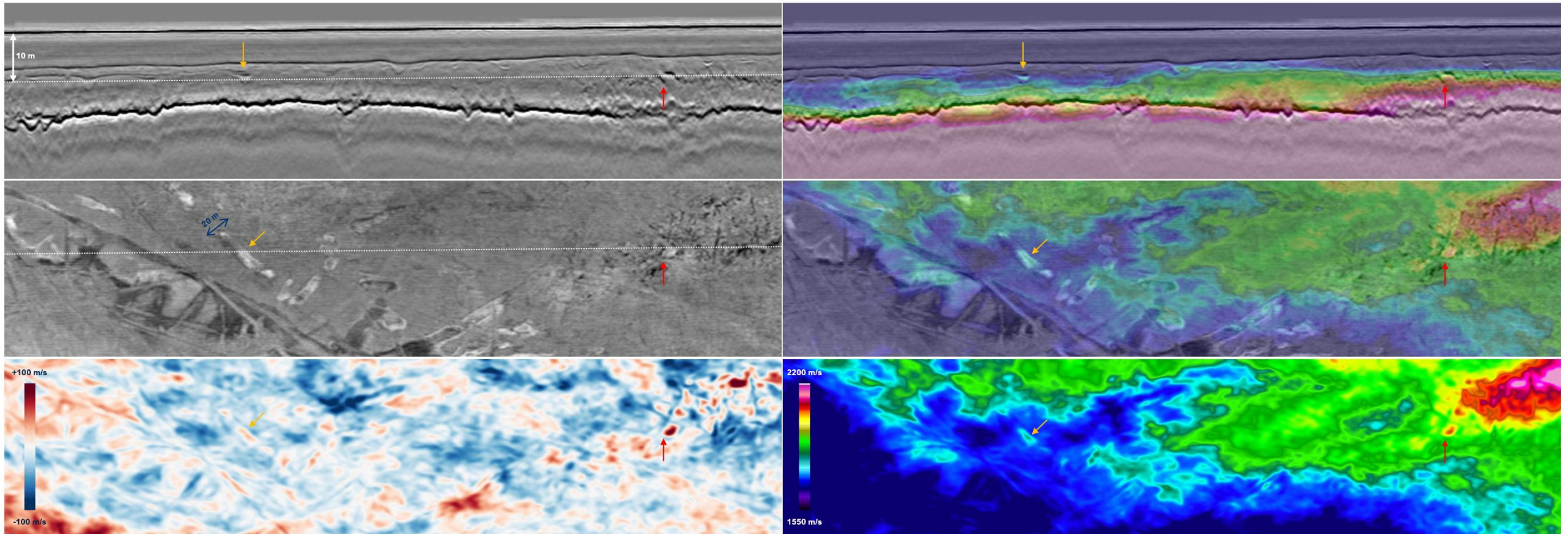
~ 15 m wide feature

2D Line

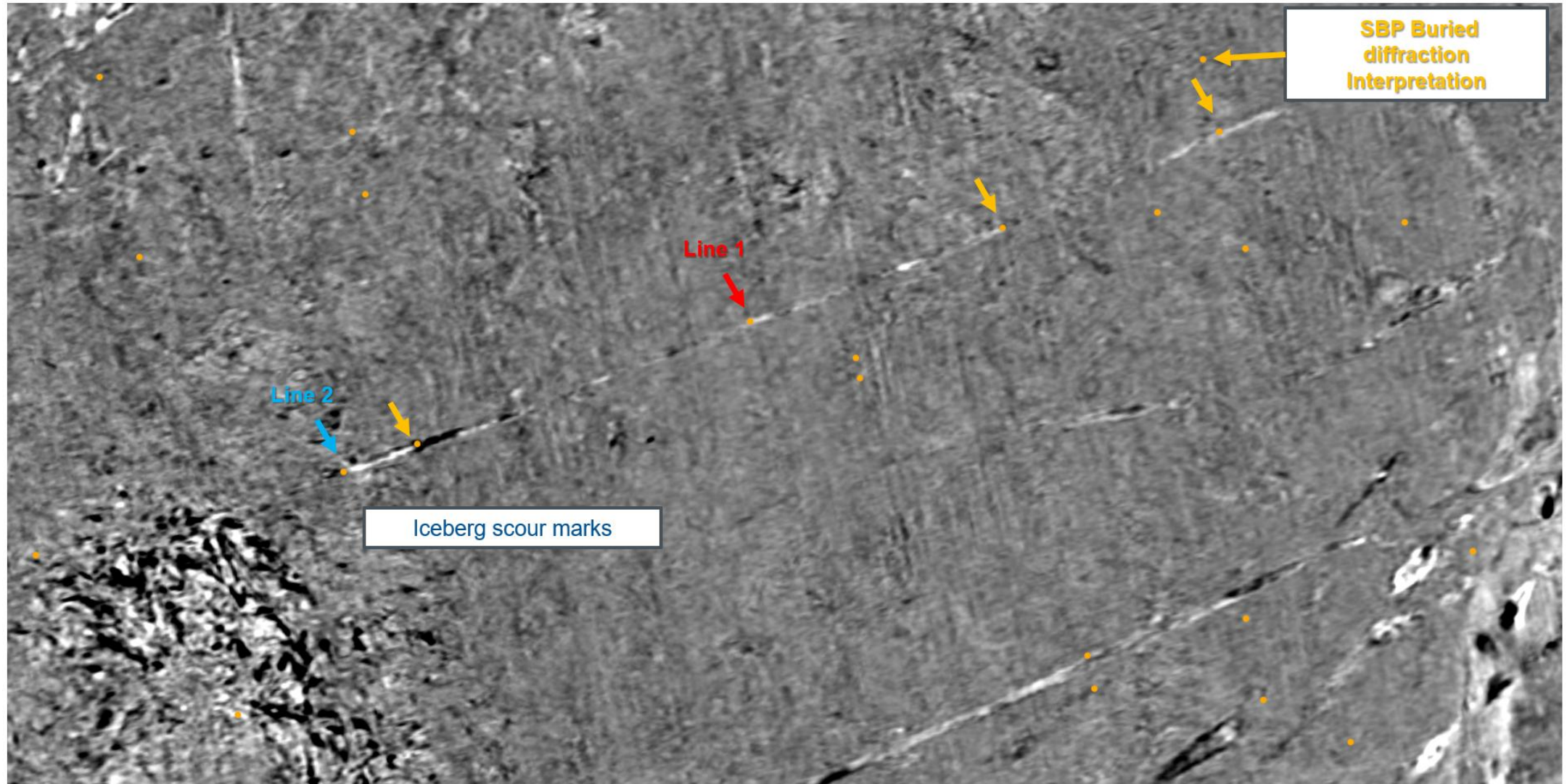
~ 10 m

0 100 200 300 400 500 600 700 800 900 500
metres

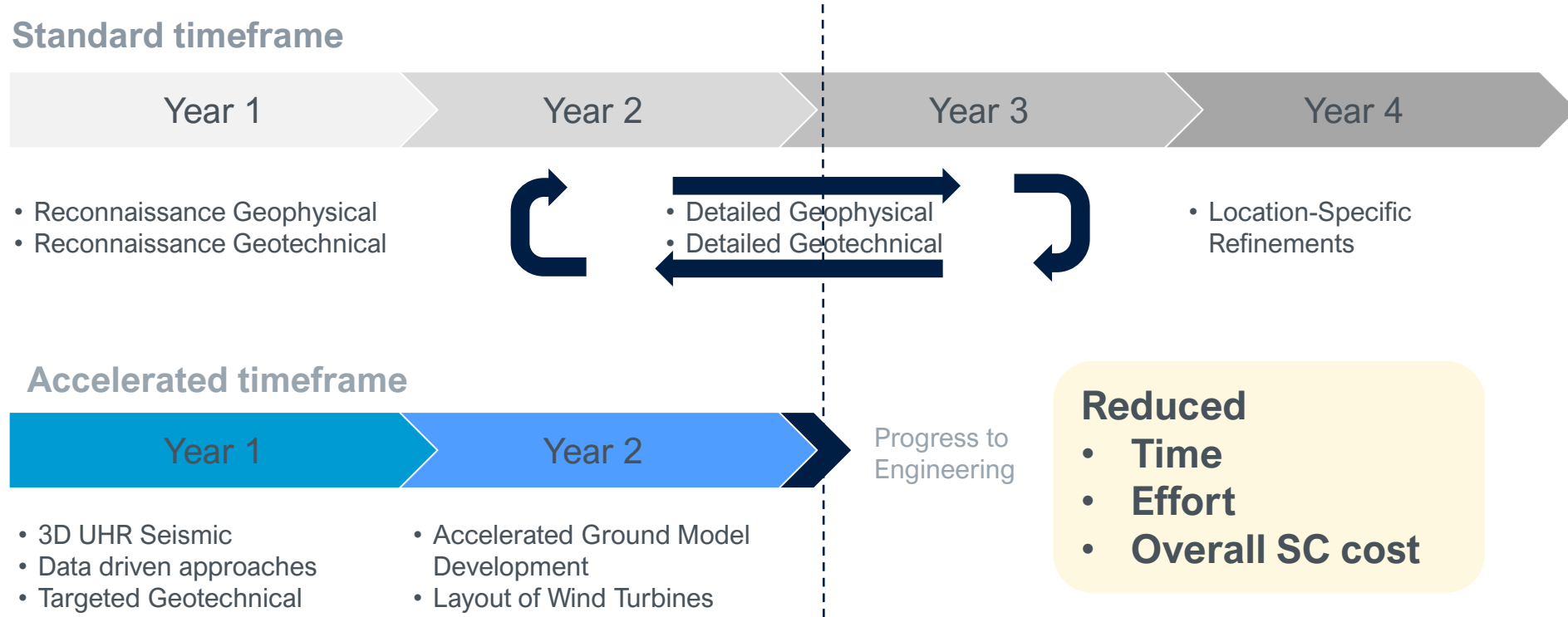
Detailed soil property delineation



Realistic geohazard assesment



An early integrated UHR3D survey enables time and cost savings



Summary



- A single pass integrated UHR3D survey enables seabed and subsurface soil units to be delineated, soil properties estimated, and hazardous features identified
- Incorporation of an integrated UHR3D survey should enable the overall time and cost to characterize sites to be reduced
- Using 3D we can decrease in the number of geophysical surveys that need to be undertaken
- Optimization of geotechnical surveys may be possible: further reduction in survey activity

Thank you

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Energy Starts With Us