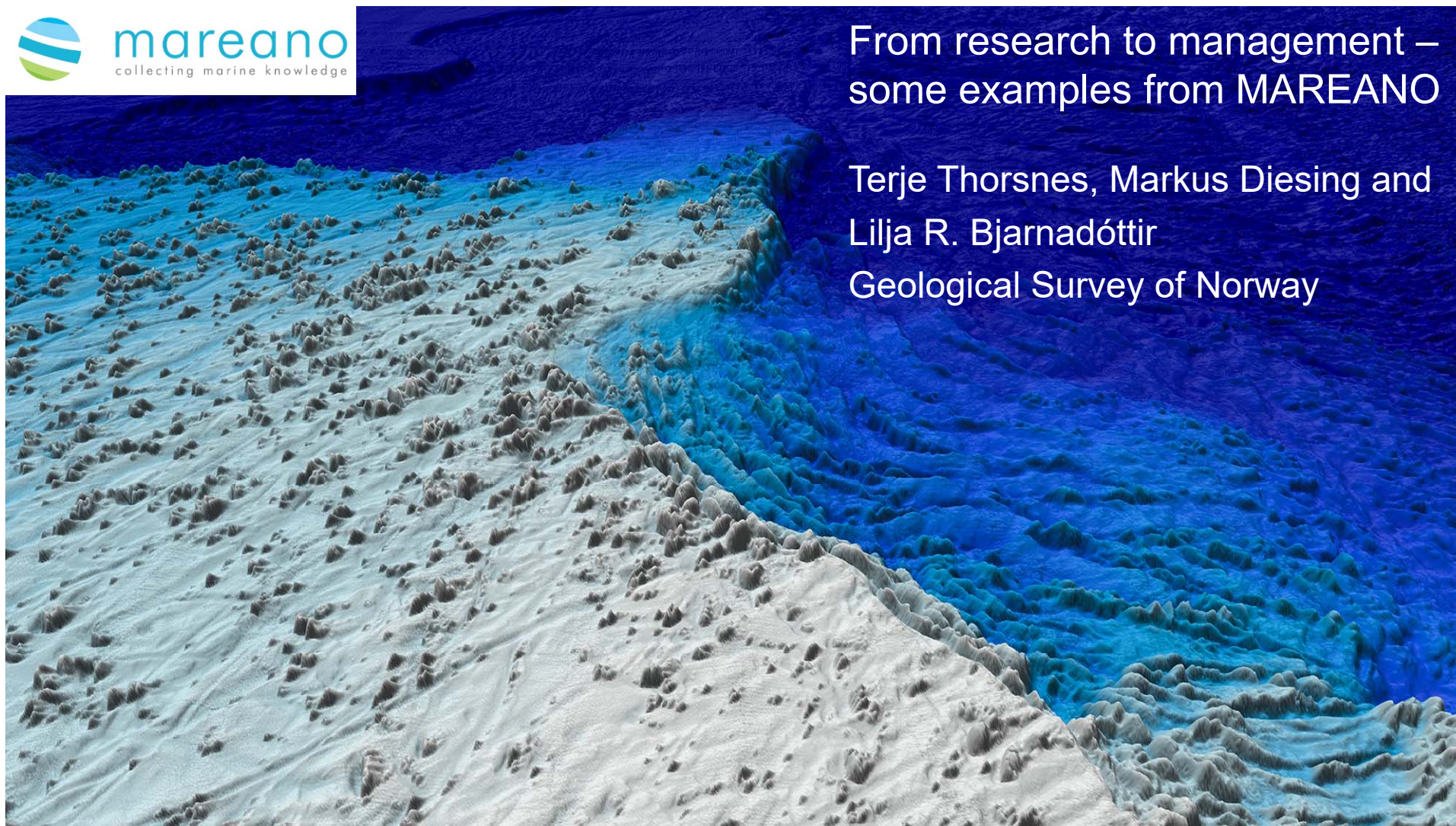


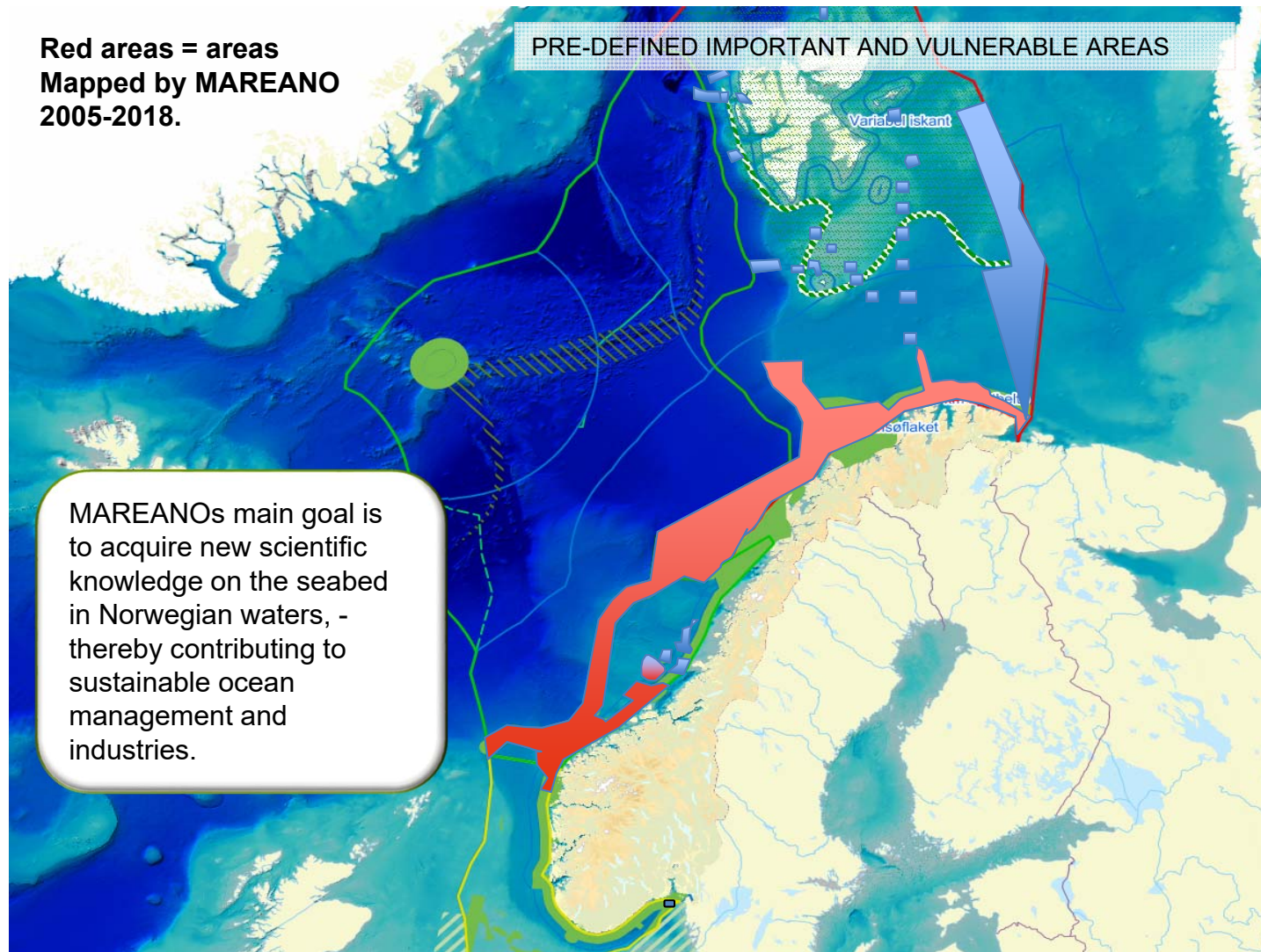
From research to management – some examples from MAREANO

Terje Thorsnes, Markus Diesing and
Lilja R. Bjarnadóttir
Geological Survey of Norway



**Red areas = areas
Mapped by MAREANO
2005-2018.**

PRE-DEFINED IMPORTANT AND VULNERABLE AREAS



MAREANOs main goal is to acquire new scientific knowledge on the seabed in Norwegian waters, - thereby contributing to sustainable ocean management and industries.

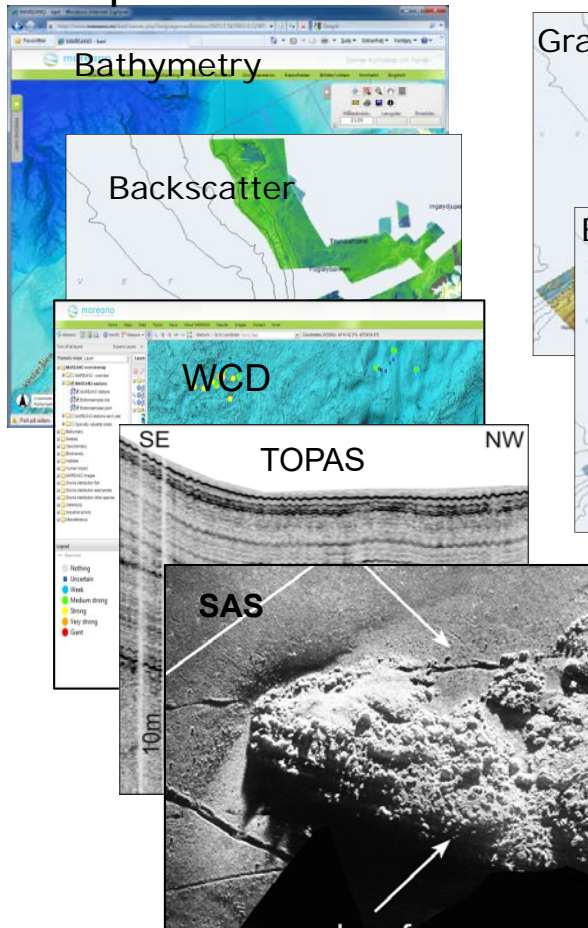
MAREANO Steering group



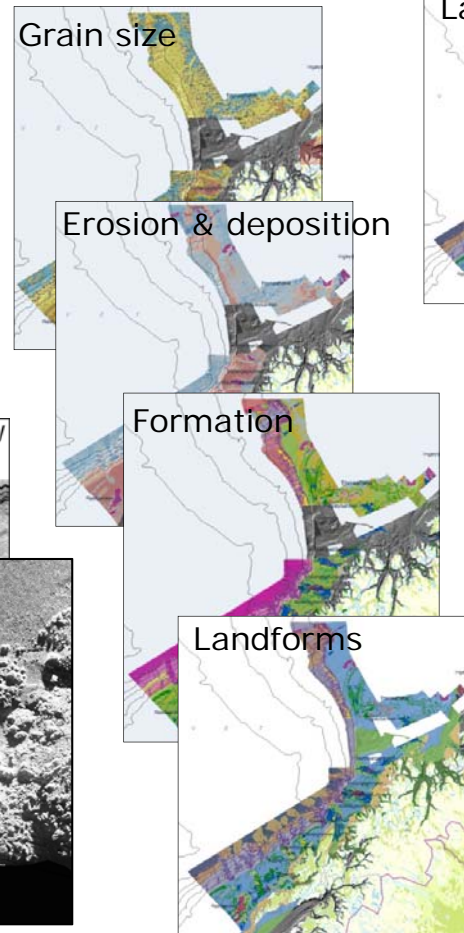
MAREANO Programme group



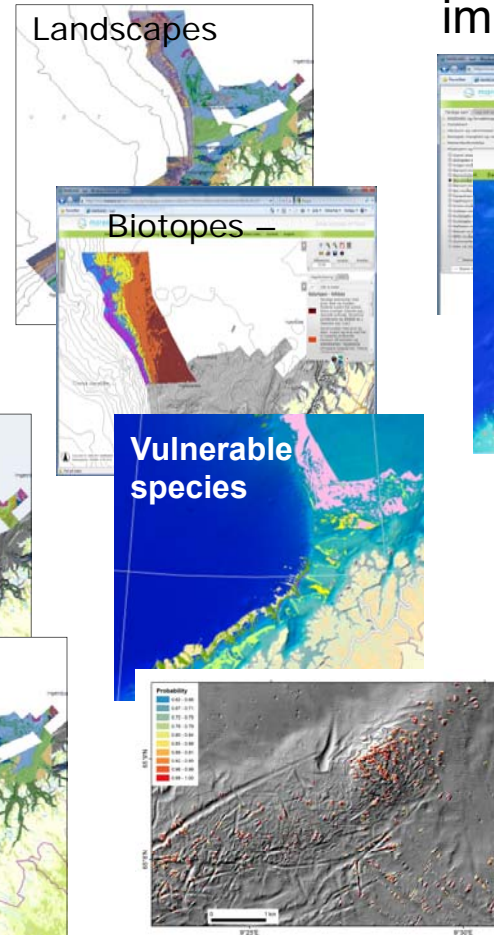
Acoustic data and samples



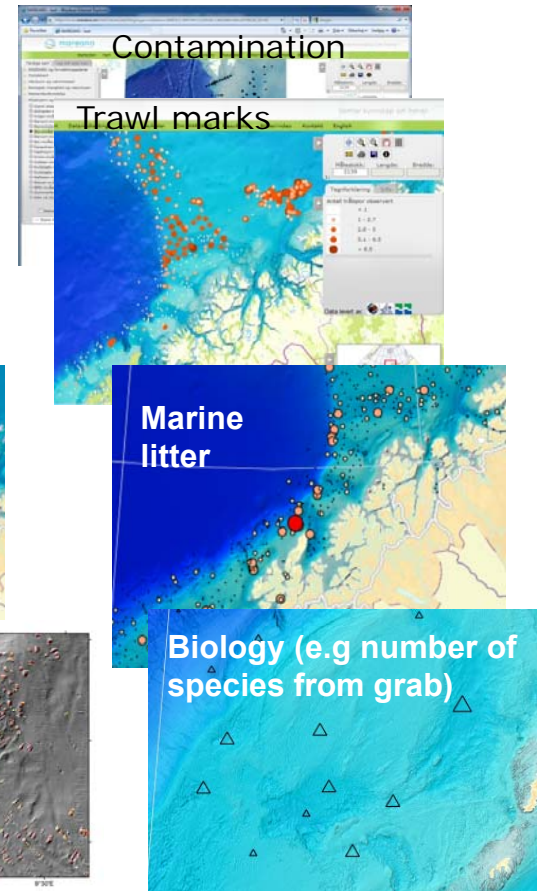
Sediment maps



Modelled maps

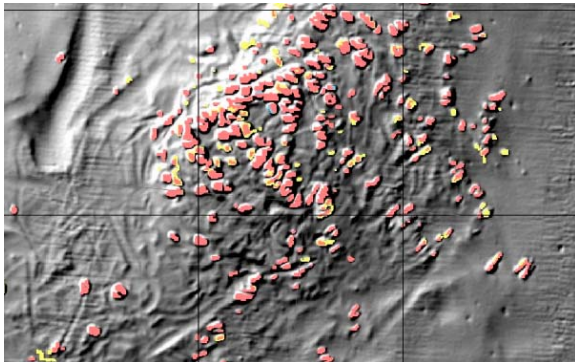


Biology and human impact maps

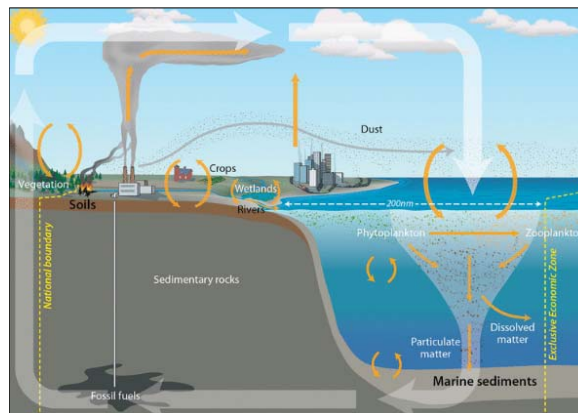


3 examples

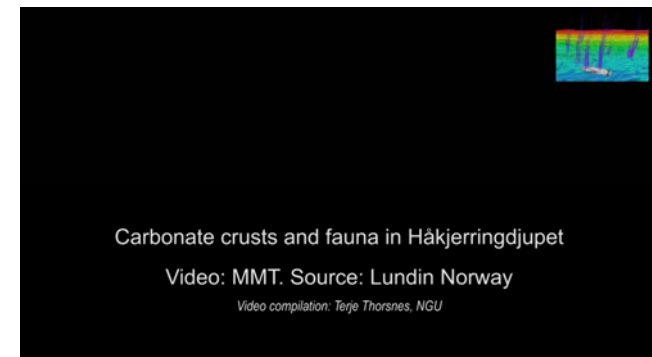
OBIA coral reefs

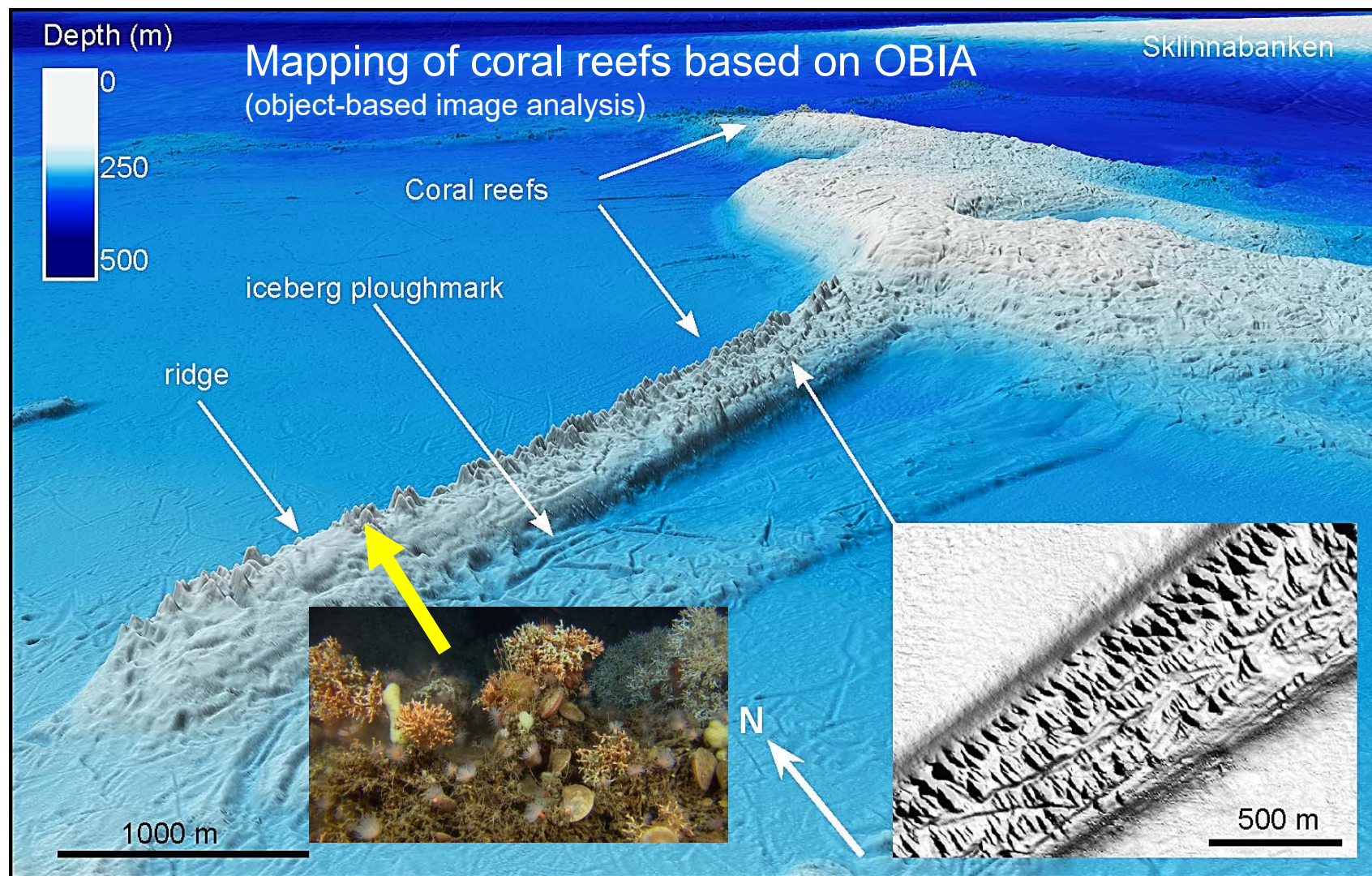


Dark Blue Carbon



Cold seeps





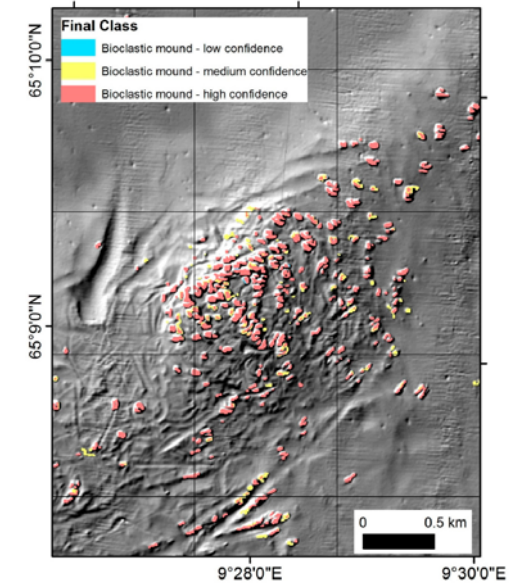
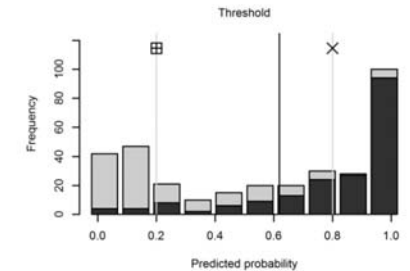
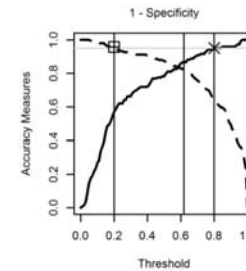
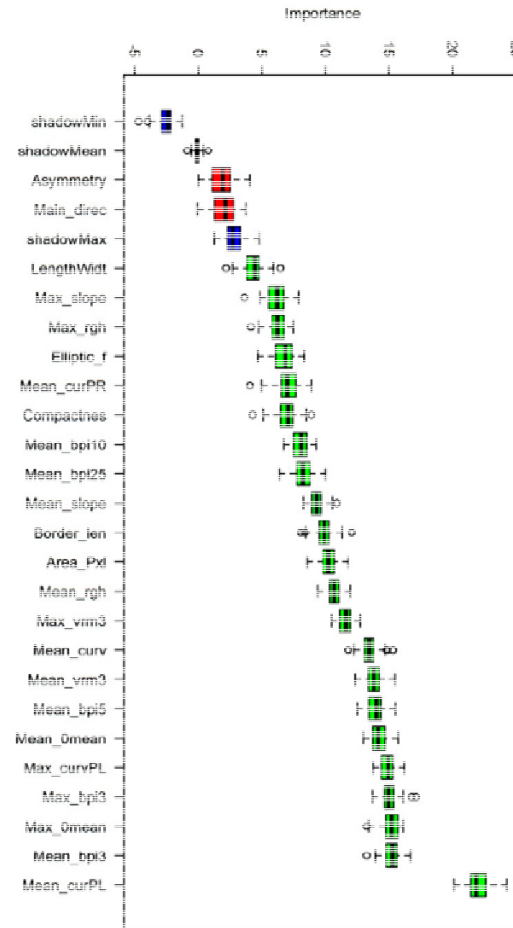
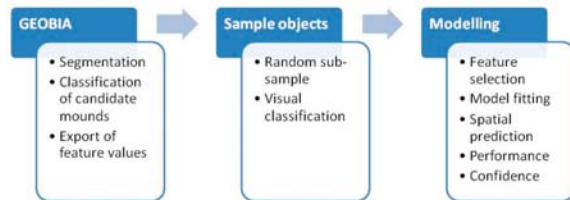
Mapping of Cold-Water Coral Carbonate Mounds Based on Geomorphometric Features: An Object-Based Approach

Markus Diesing  and Terje Thorsnes

Geological Survey of Norway, Postal Box 6315 Torgarden, NO-7491 Trondheim, Norway; terje.thorsnes@ngu.no
* Correspondence: markus.diesing@ngu.no; Tel.: +47-7390-4309

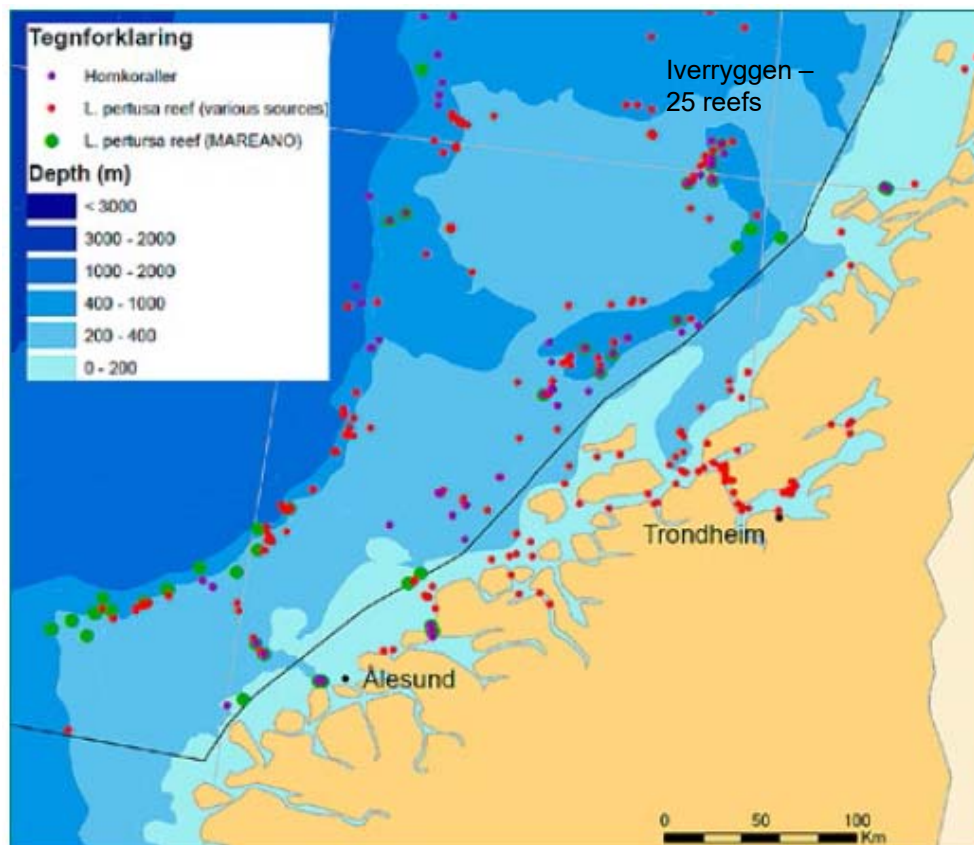
Received: 14 December 2017; Accepted: 20 January 2018; Published: 23 January 2018

Derivative	Description	Abb.	Unit	Reference
Slope	The maximum slope gradient	slope	°	[22]
Roughness	The difference between minimum and maximum of a cell and its eight neighbours.	rgl	m	[22]
Vector ruggedness measure (VRM)	The variation in three-dimensional orientation of grid cells within a neighbourhood. A radius of 3 pixels was used.	vrn3	—	[23]
Curvature	Rate of change of slope. Profile (PR) curvature is measured parallel to maximum slope; plan (PL) curvature is measured perpendicular to slope.	Curv: curvPL curvPR	—	[22]
Bathymetric position index (BPI)	Vertical position of a cell relative to its neighbourhood. Radii of 3, 5, 10 and 25 pixels were used.	bpi3 bpi5 bpi10 bpi25	m	[24]
Zero-mean bathymetry	A moving mean filter with a rectangular neighbourhood of 25 m by 25 m was applied to the bathymetry layer. The resulting smoothed bathymetry was subtracted from the bathymetry layer.	0mean	m	[25]

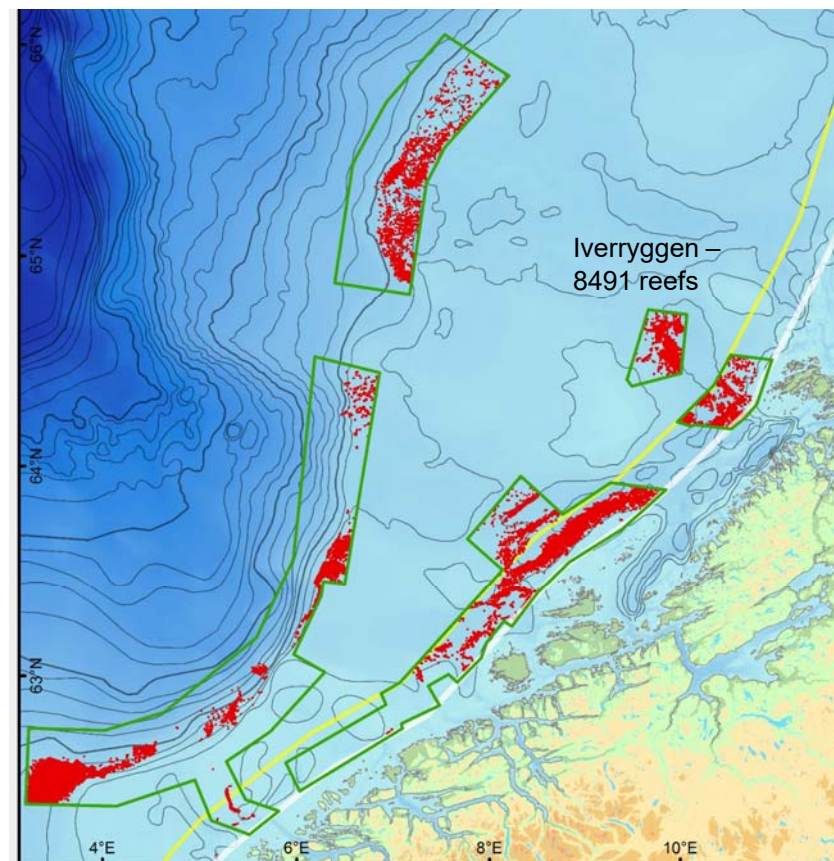


Coral reef maps for management

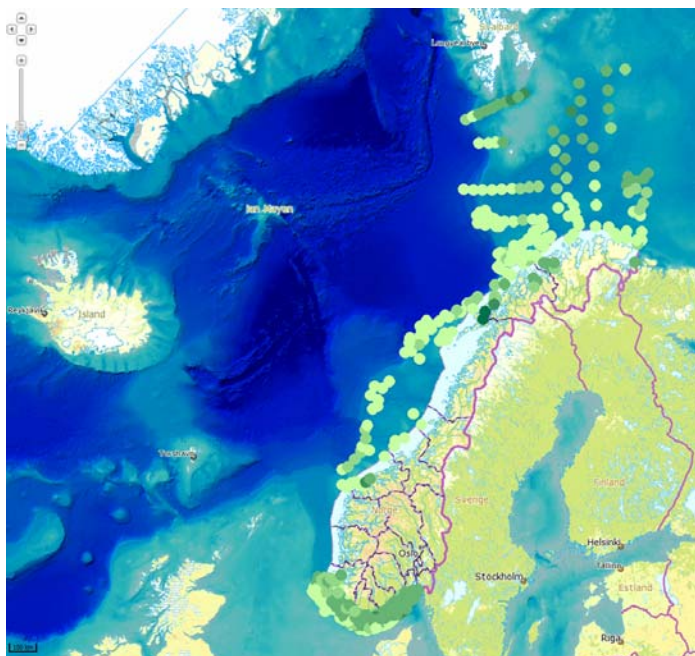
Coral reefs – observations (video, trawl etc.)



Coral reefs (red) – OBIA mapping



Sediments as carbon traps – "Dark Blue Carbon"

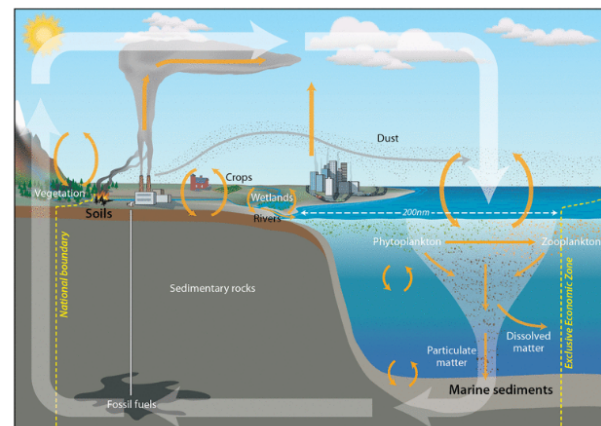


The anticipated products include i) the total size of the sedimentary organic carbon stock, ii) a map of spatial variations in carbon density, iii) a map showing spatial variation in carbon burial rates, iv) estimates of the residence time of organic carbon in the zone of active degradation and v) a peer-reviewed publication. These outputs are expected to be relevant in terms of valuing and accounting for the seafloor as a carbon store, marine spatial management, e.g. through protection of high-density carbon areas from disturbance ("carbon protection zones") and a better understanding of the long-term storage of carbon.

Should carbon stored in marine sediments be reported as part of greenhouse gas inventories?

The amount of carbon stored in marine sediments within national exclusive economic zones (EEZs) - areas of coastal water and seabed within a certain distance of a country's coastline -, can be equal to or larger than carbon stored on land, new [research](#) by Silvania Avelar, Tessa van Voort and Timothy Eglinton published in *Carbon Balance and Management* shows.

[Dr. Silvania Avelar, Tessa S. van Voort & Dr. Timothy I. Eglinton](#) 10 May 2017



General representation of the global carbon cycle

Until now, research in the context of greenhouse gas reporting on a nation-by-nation basis



[Dr. Silvania Avelar, Tessa S. Van Voort & Dr. Timothy I. Eglinton](#)

Dr. Silvania Avelar is a research scientist at the Geological Institute of ETH Zurich. Her current research focuses on understanding issues in coastal and marine environments, analyzing and visualizing local and global data, in order to find innovative solutions to address sustainability challenges.

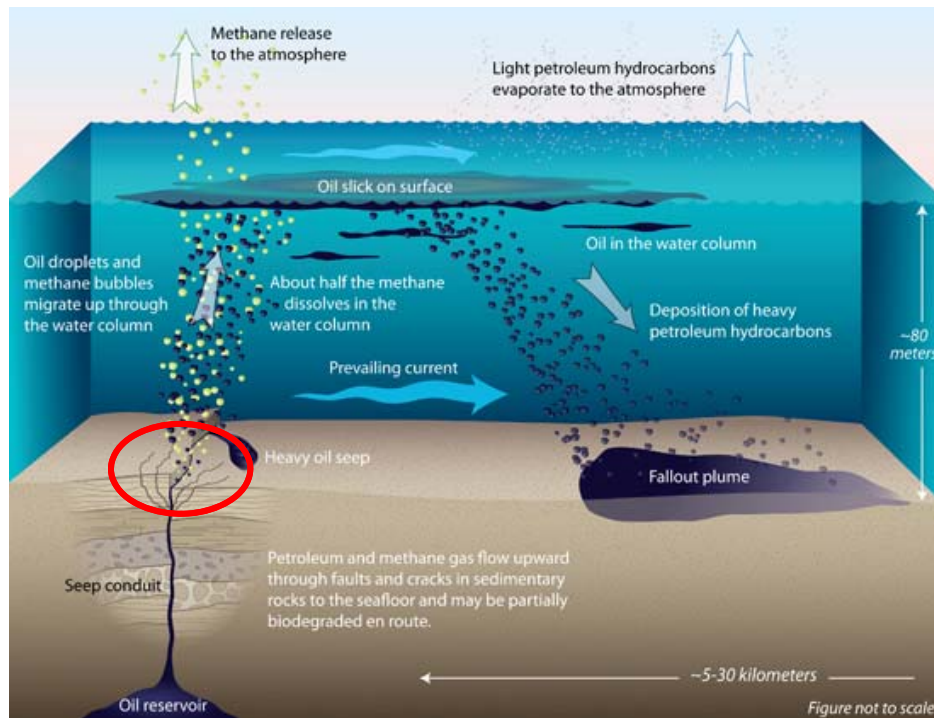
Tessa S. van Voort is a PhD student at the Geological Institute of ETH Zurich. She is leading efforts to comprehend soil carbon dynamics in the context of environmental change.

Dr. Timothy I. Eglinton is a professor of Biogeoscience at the Geological Institute of ETH Zurich. Currently his research focuses on better understanding the processes that govern the Earth's carbon cycle from molecular level to the global scale.

POPULAR ON BIOLOGY TAGS

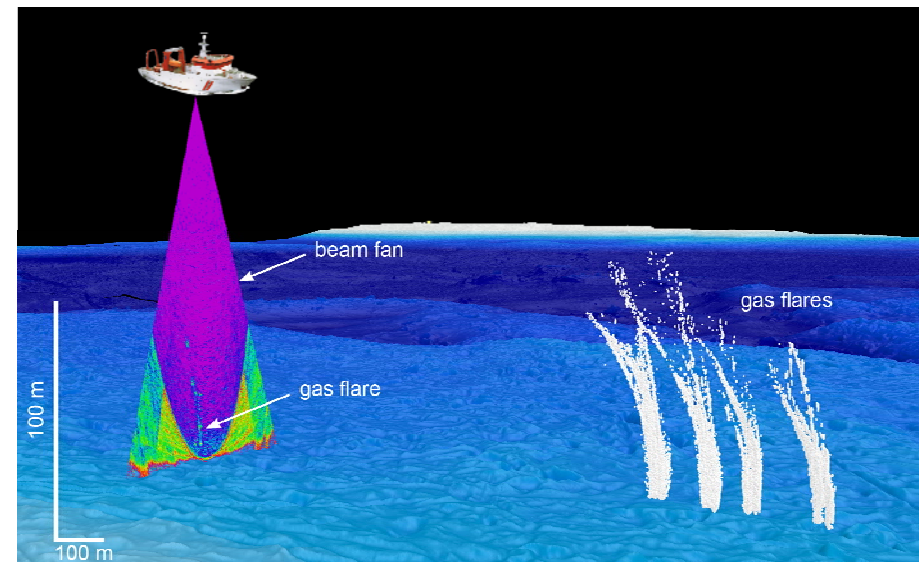
Cold seep ecosystems – detection and mapping

Oil and gas seep to the seabed, and to the atmosphere

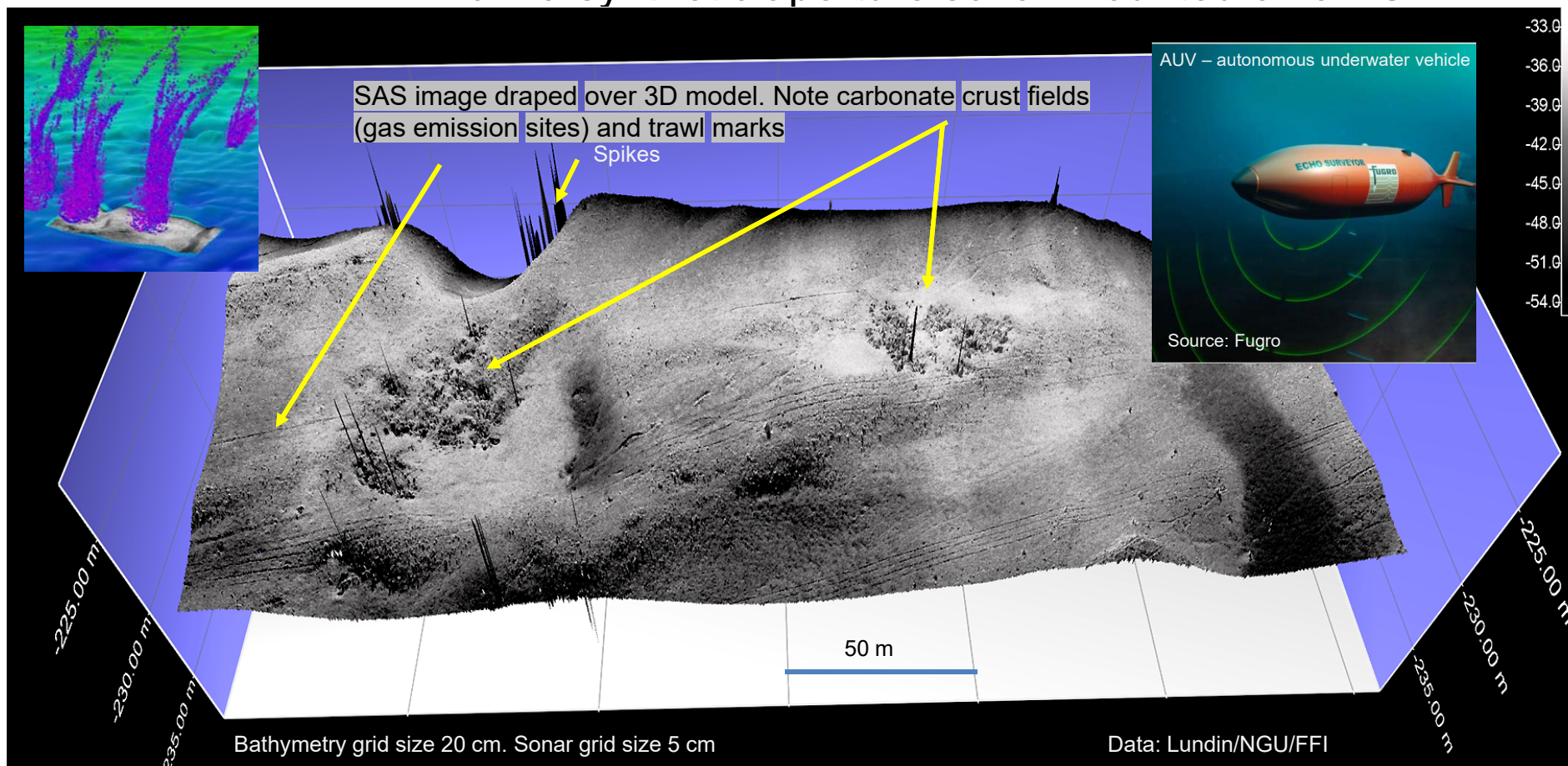


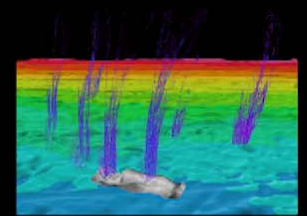
Source: Wood's Hole Oceanographic Institution

Multibeam echosounder including water column data



Acoustic "photograph" (5x5 cm) of the seabed, produced from a synthetic aperture sonar mounted on a AUV





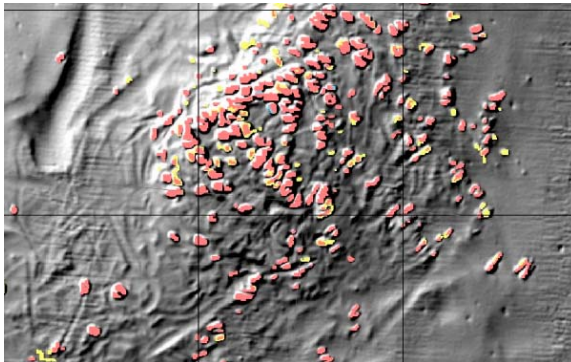
Carbonate crusts and fauna in Håkjerringdjupet

Video: MMT. Source: Lundin Norway

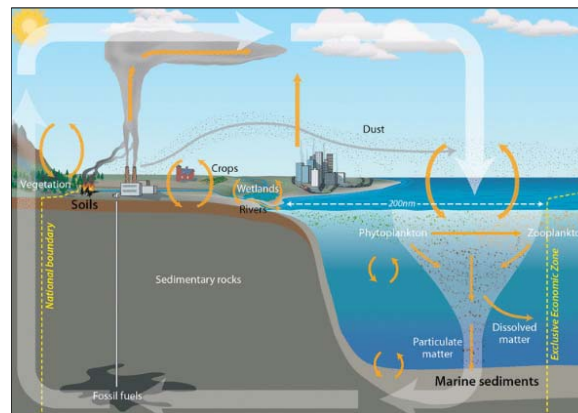
Video compilation: Terje Thorsnes, NGU

Thanks for the attention!

OBIA coral reefs



Dark Blue Carbon



Cold seeps

