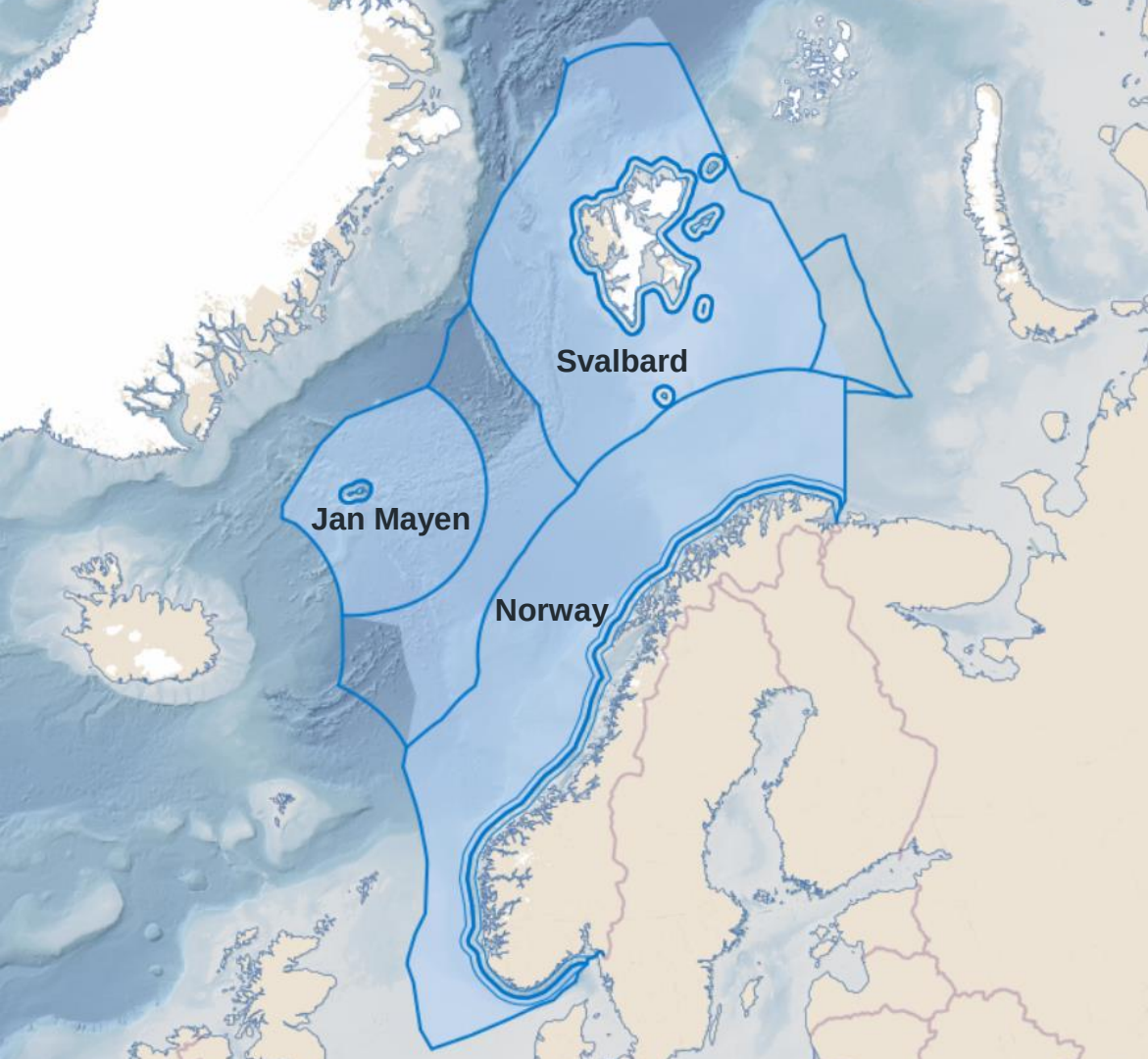


Geologisk kartlegging av havbunnen som bidrag til kunnskapsbasert og bærekraftig forvaltning og næringsutvikling

Reidulv Bøe (NGU)



**Norske havområder:
>2 000 000 km²**

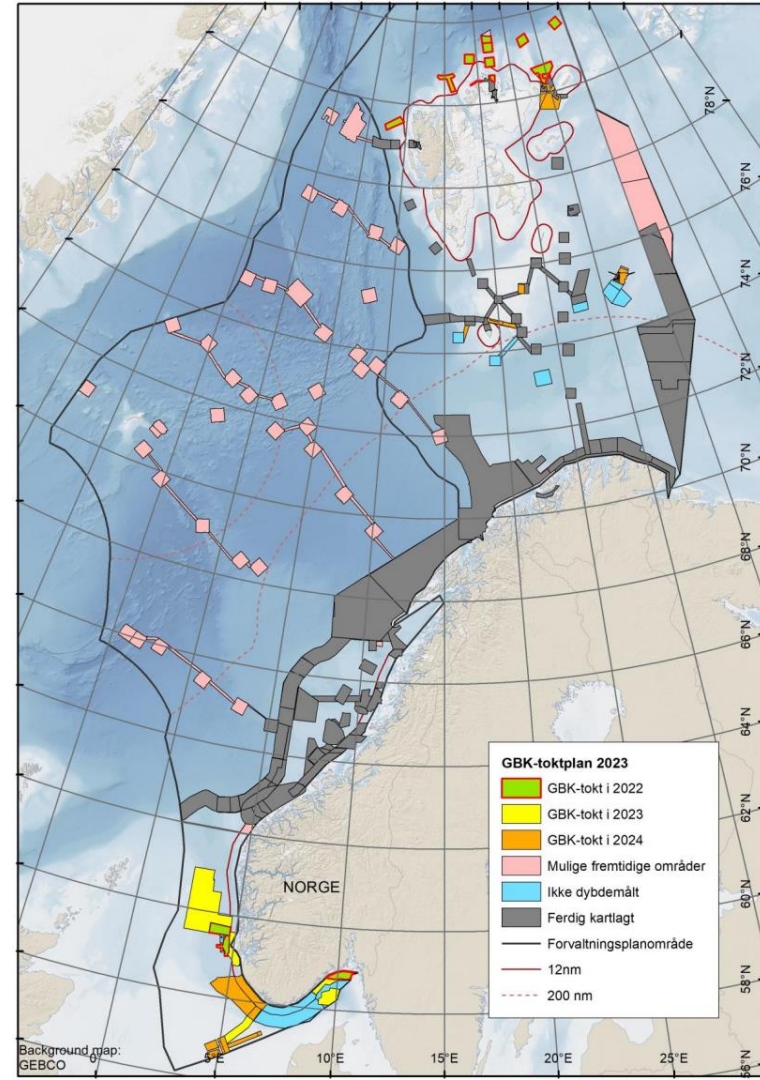
**Norges kystlinje:
100 000 km**

**Stort behov for
marin kartlegging,
mange brukere,
data trengs bl.a. for
utarbeidelse av
forvaltningsplaner**



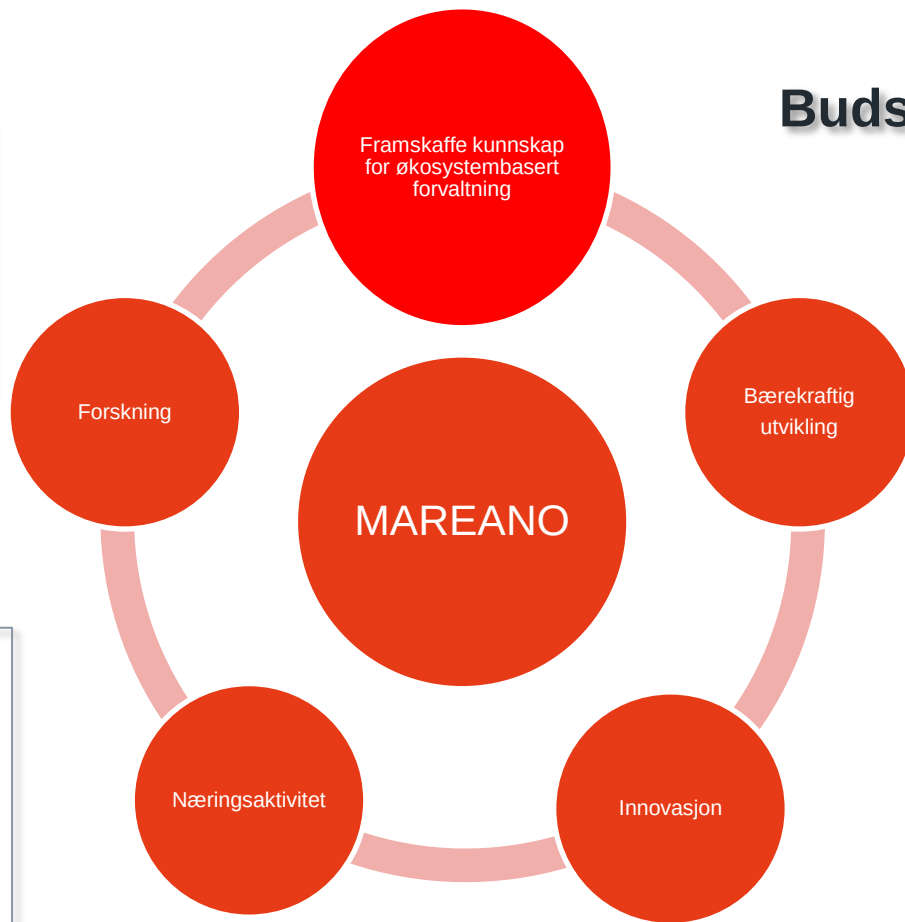
**GEOLOGICAL
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NORWAY**
· NGU ·

Mareano kartlegger dybde, bunnforhold, biologisk mangfold, naturtyper og forurensning i sedimentene i norske kyst- og havområder



**Programgruppe
med 8 etater:**
MD, FiD, OD, KV,
NP, HI, NGU, KV

**Styringsgruppe
med
5 departement:**
NFD, KLD, SD,
OED, KDD



Oppstart 2005
Budsjett 2005-2022:
**1,3 milliarder
kroner**



Tokt
Dybde og bunnreflektivitet fra
multistråleekkolodd



Tokt

Geologiske kart, avleda
temakart, miljøstatus

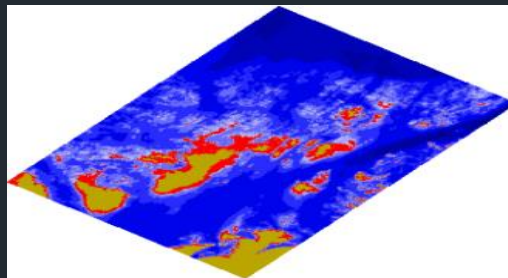
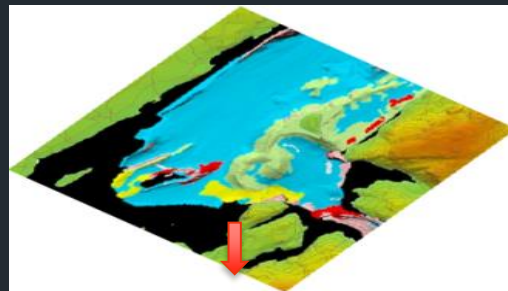
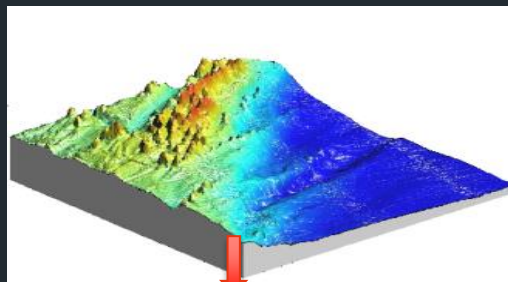


Biologiske kart, sårbare habitater



+ Oseanografi

Naturtypekart



Mareano

Marine
grunnkart



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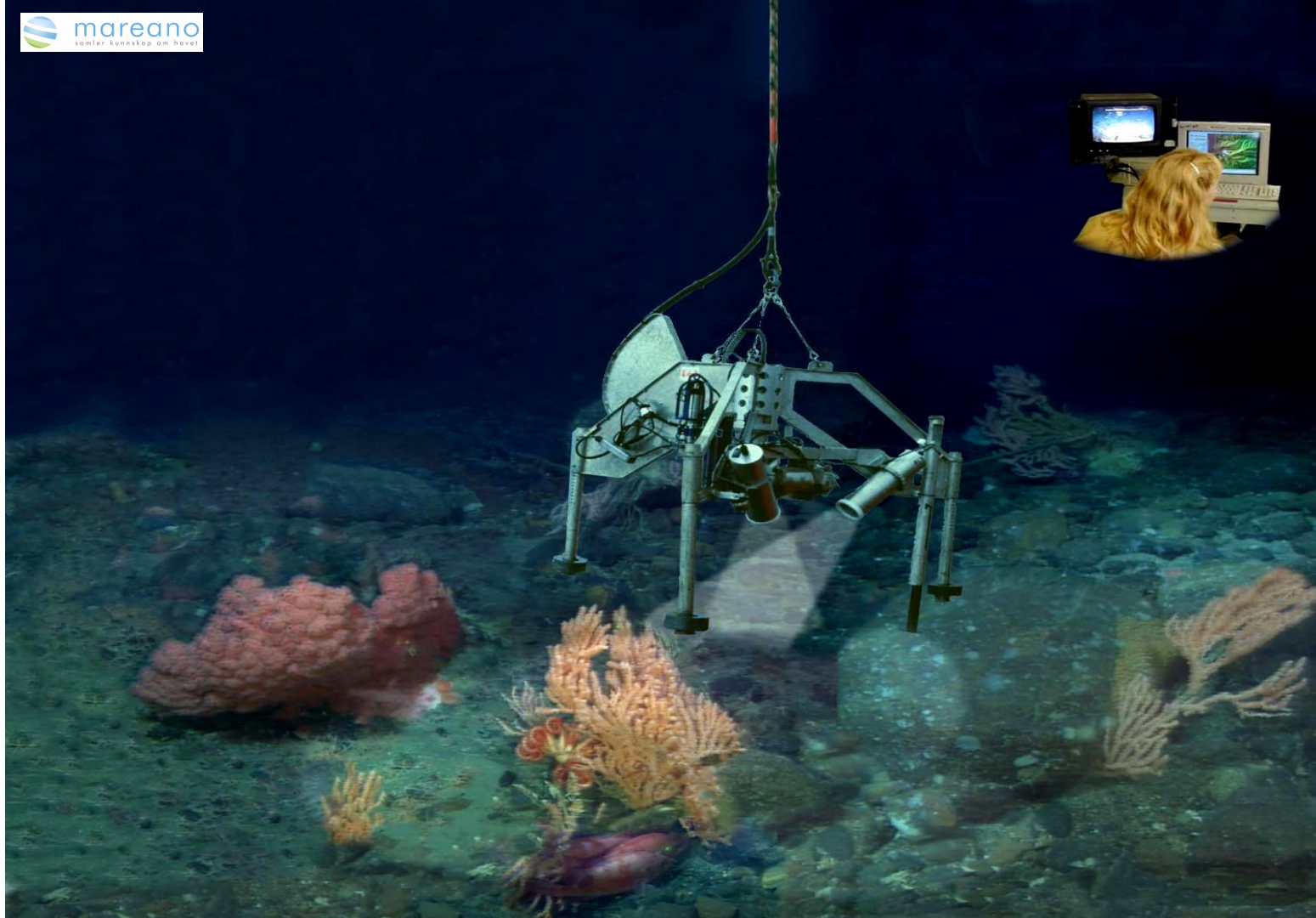
Datainnsamling på tokt i MAREANO

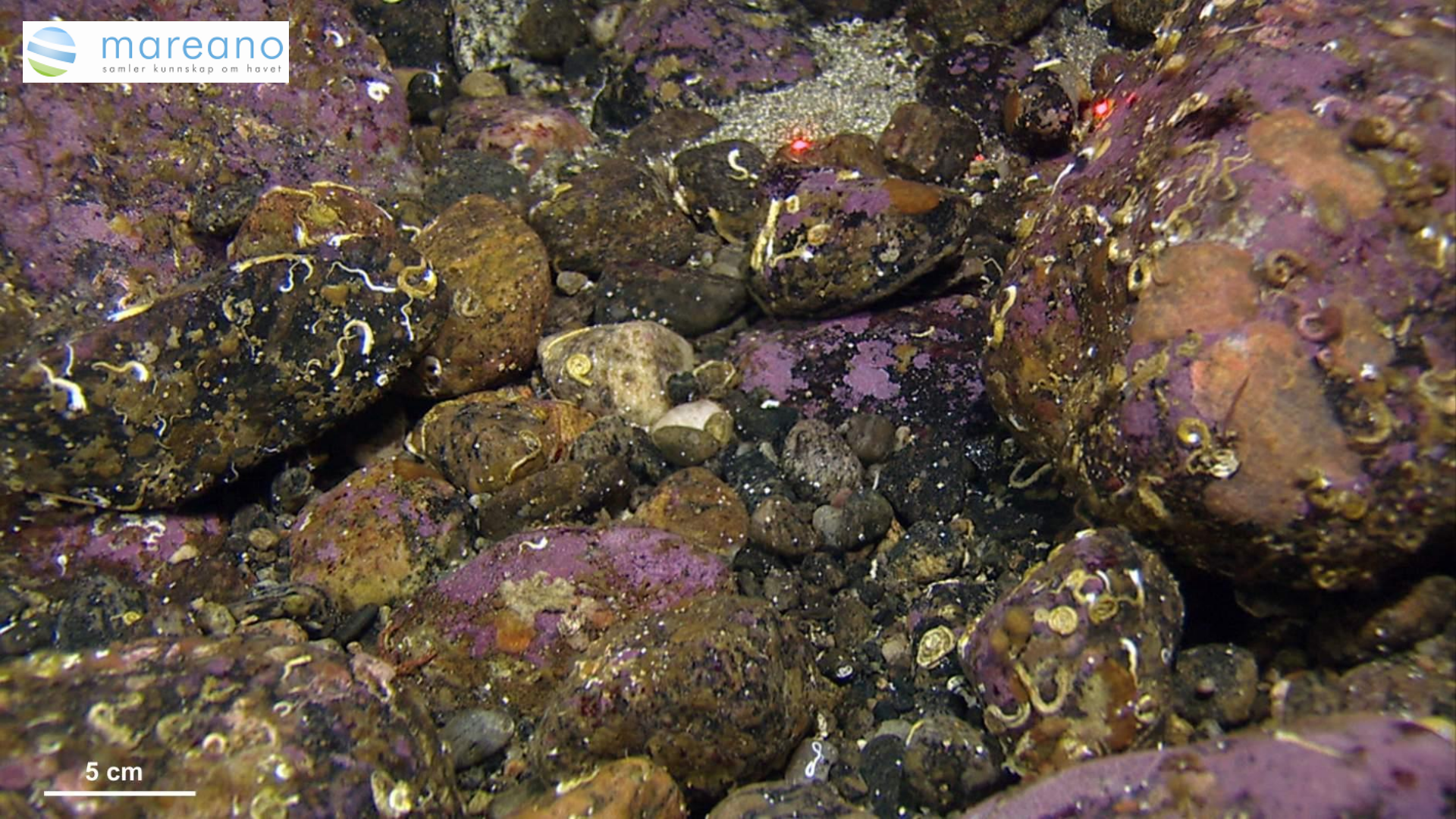
Geologiske data

Biologiske data

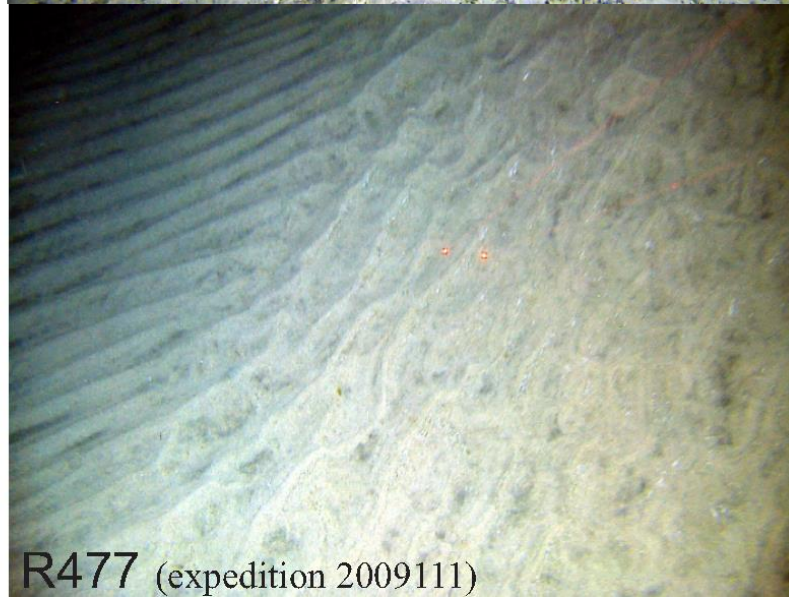
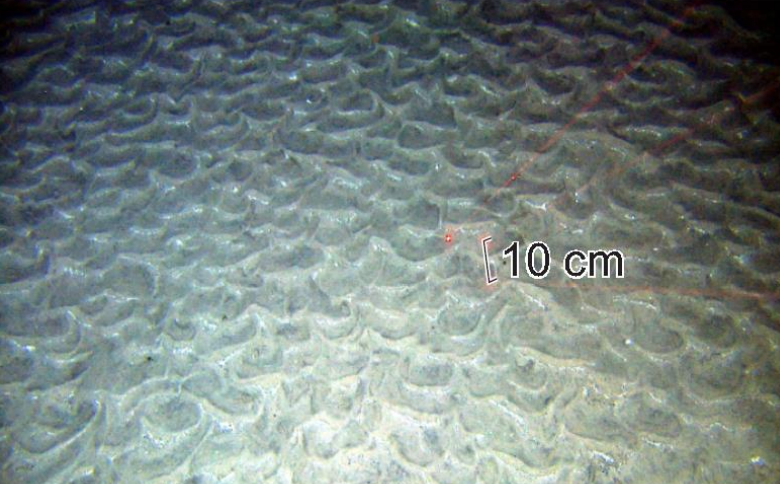
Kjemidata







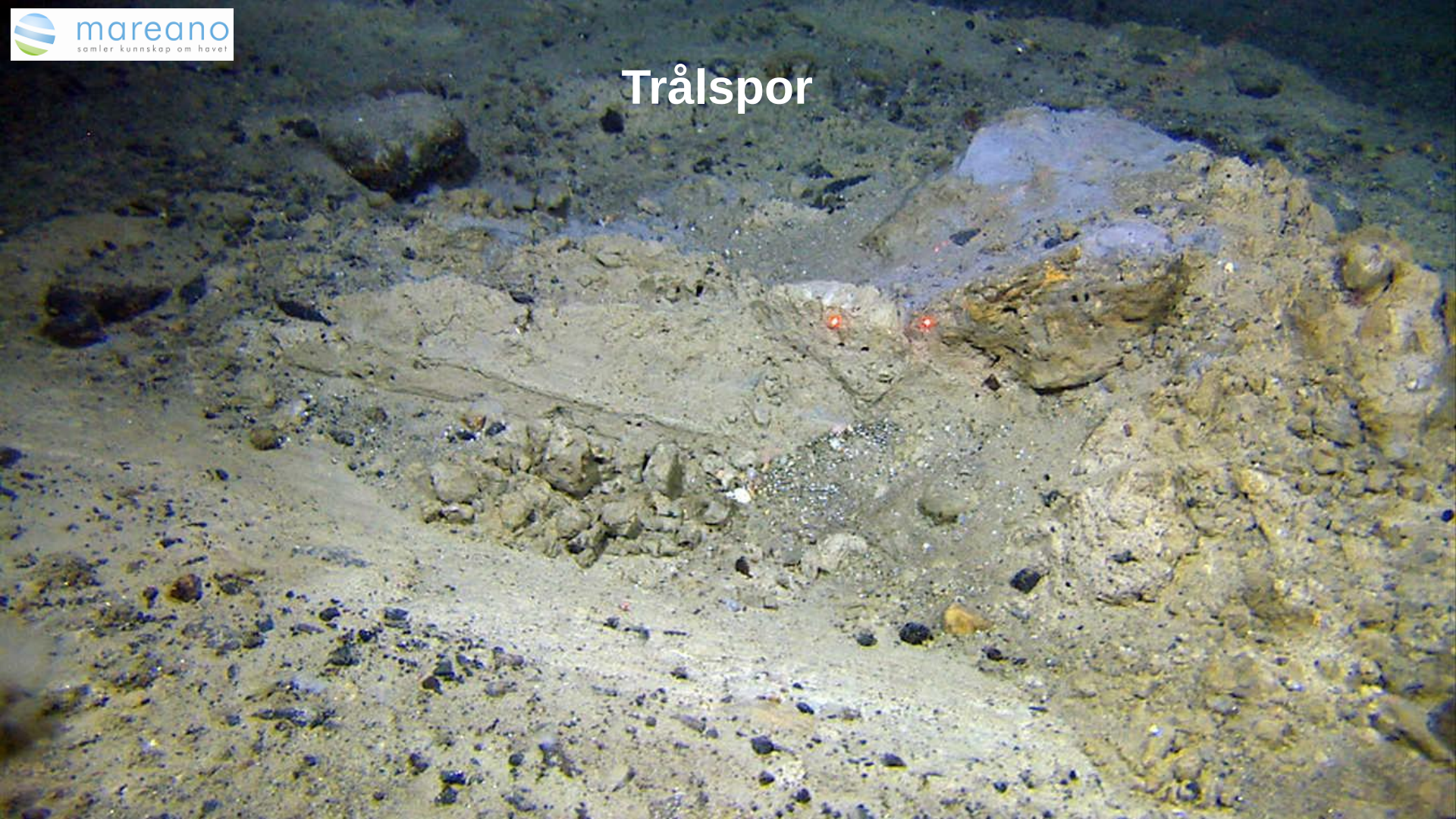
5 cm



R446 (expedition 2010110)

R477 (expedition 2009111)

Trålspor



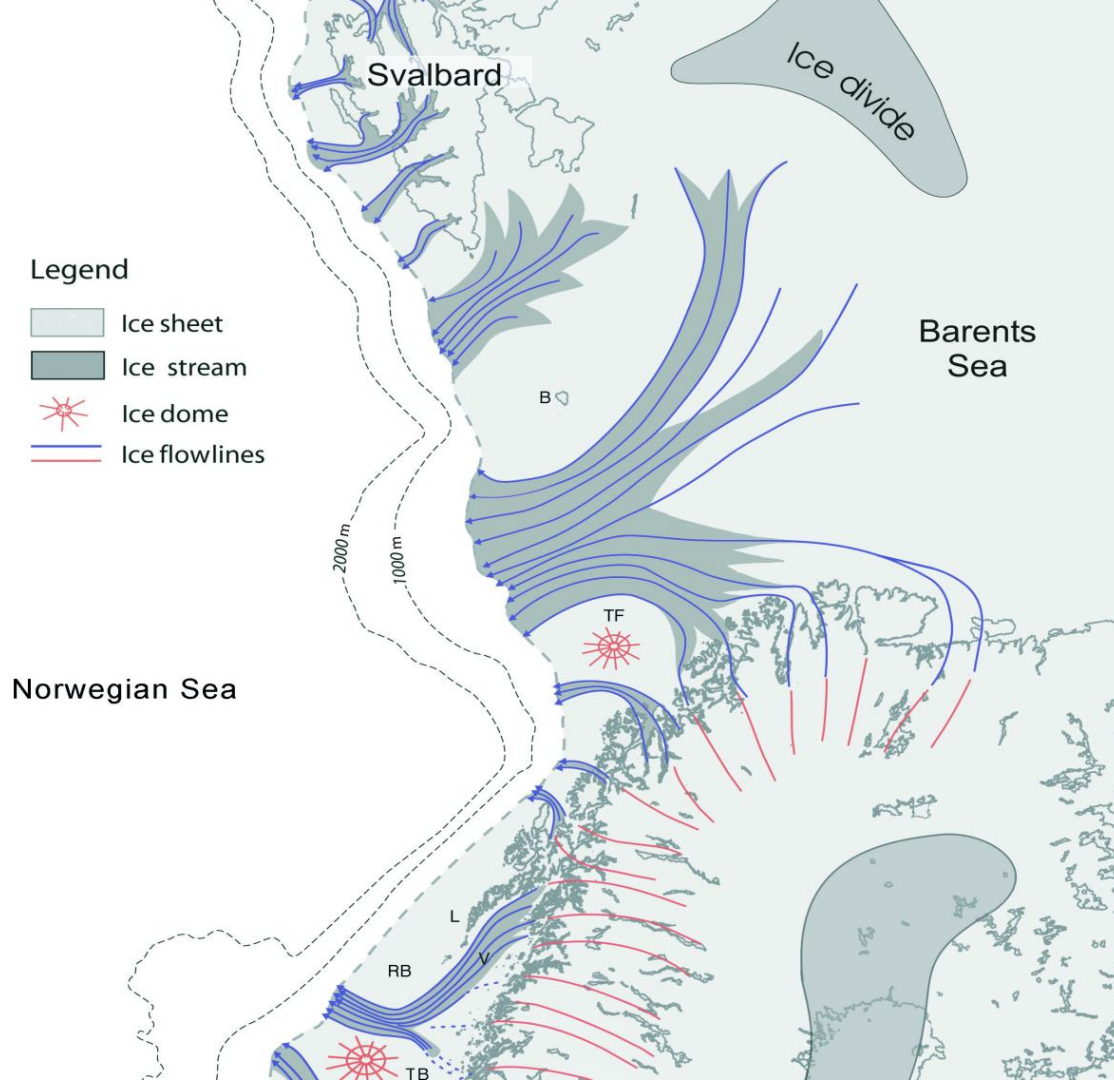


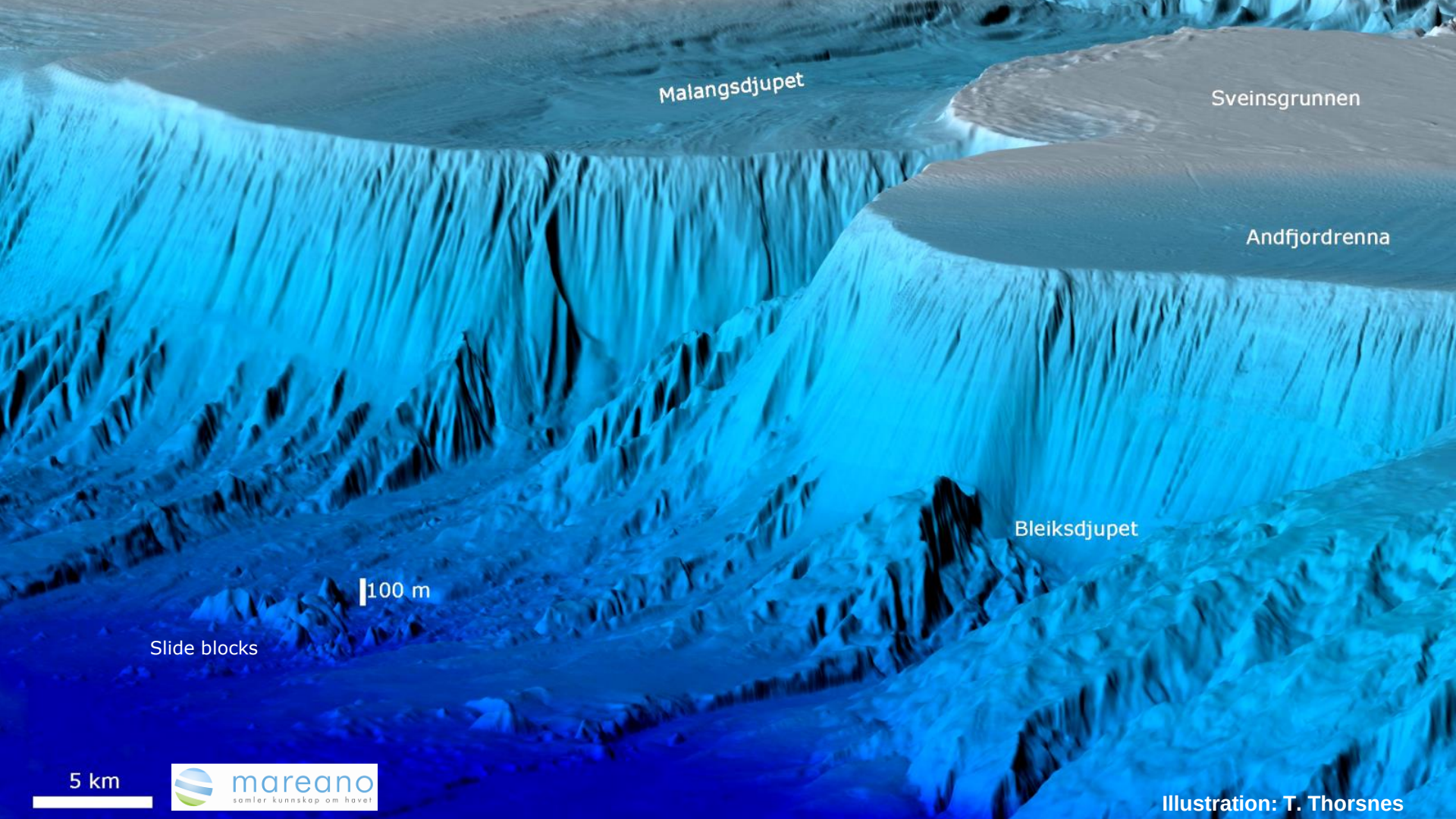
Soppbola

Steinbitryggen



Isstrømmer under siste istids maksimum





Malangsdjupet

Sveinsgrunnen

Andfjordrenna

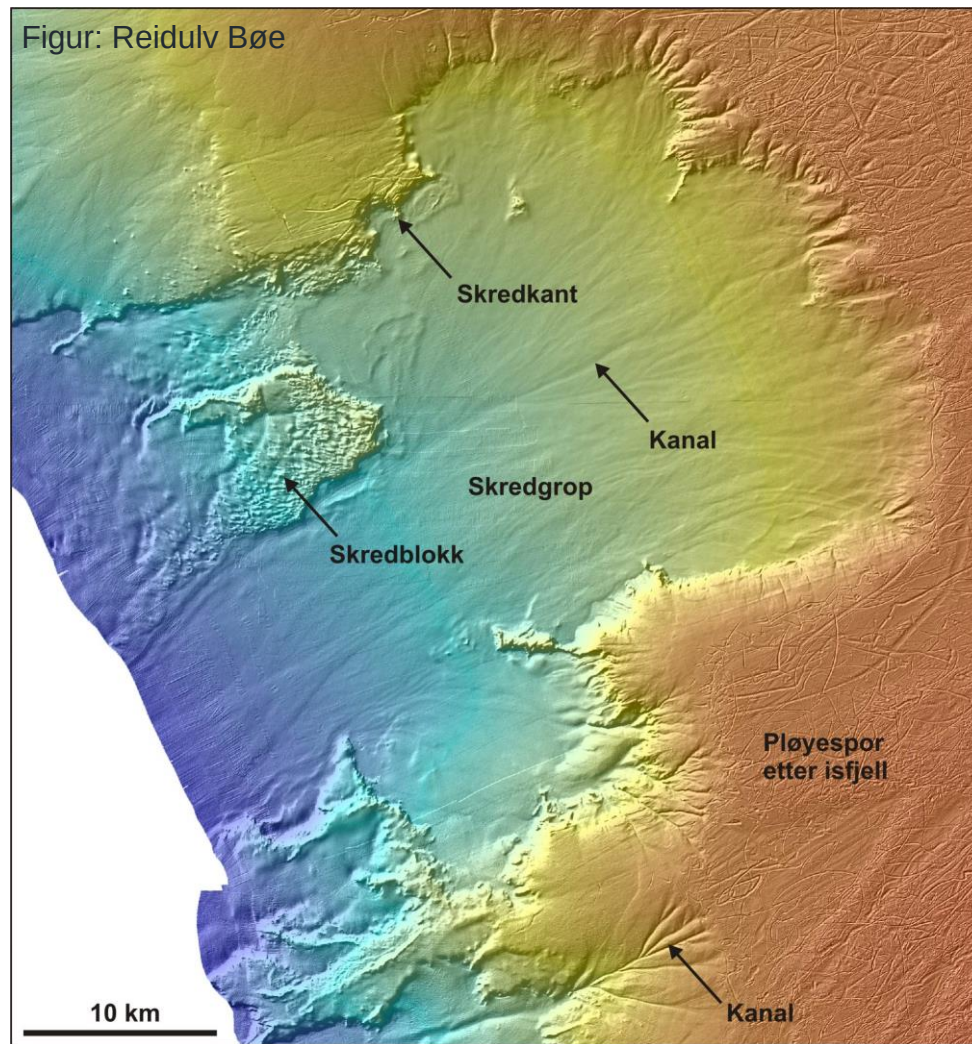
Bleiksdjupet

100 m

Slide blocks

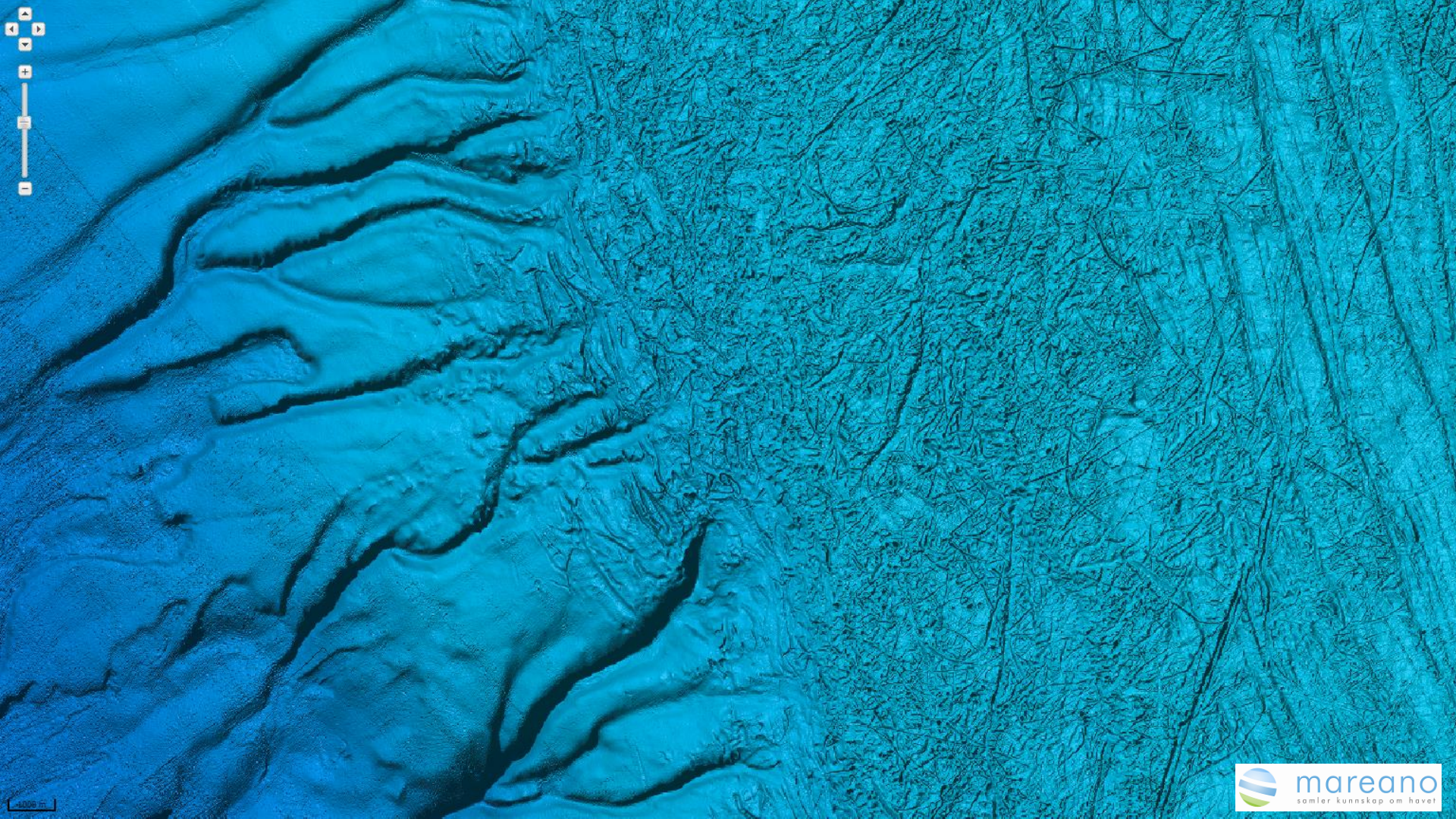
5 km

Figur: Reidulv Bøe



Bjørnøyaraset

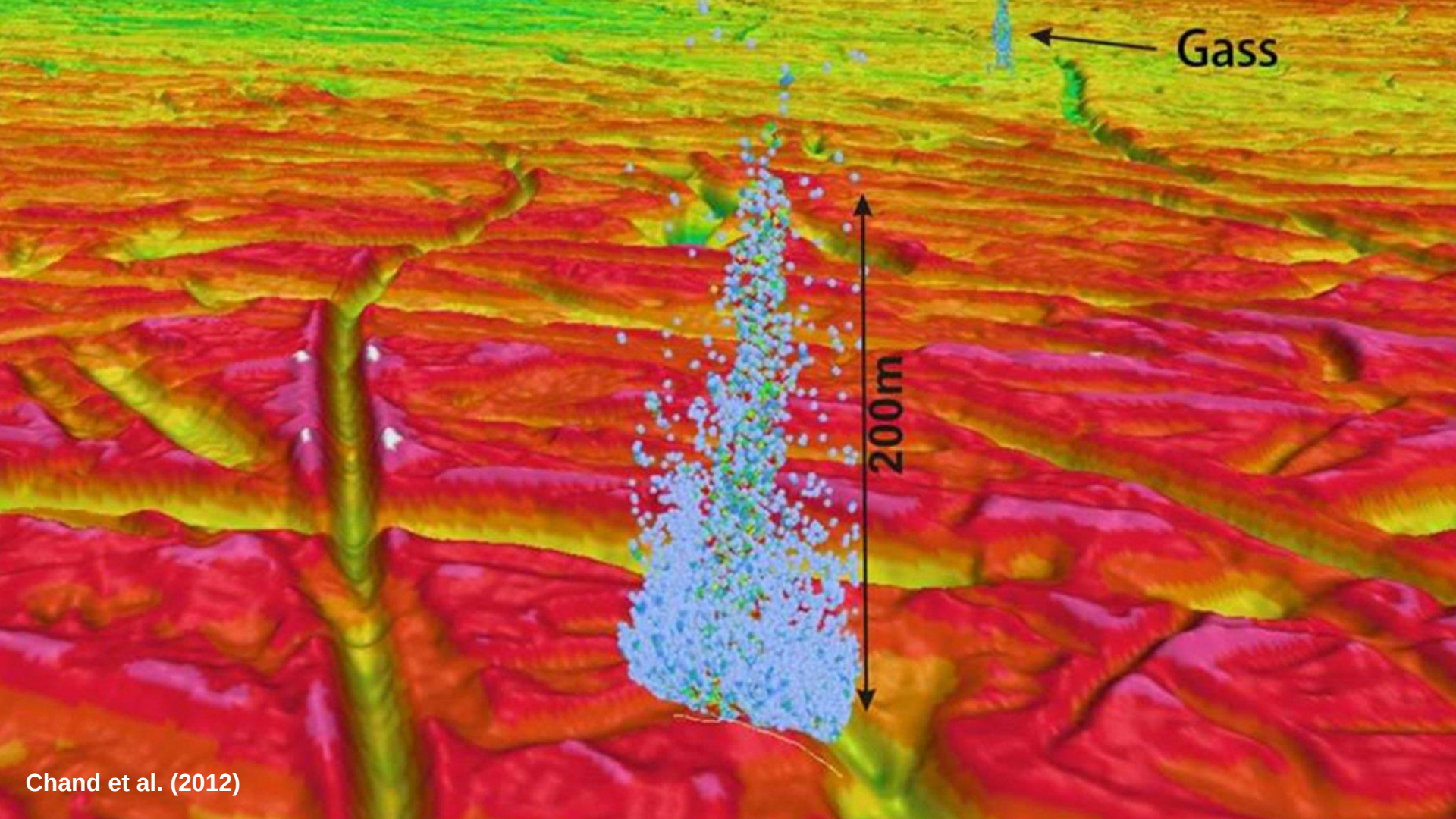
Ca. 200 000
år gammelt

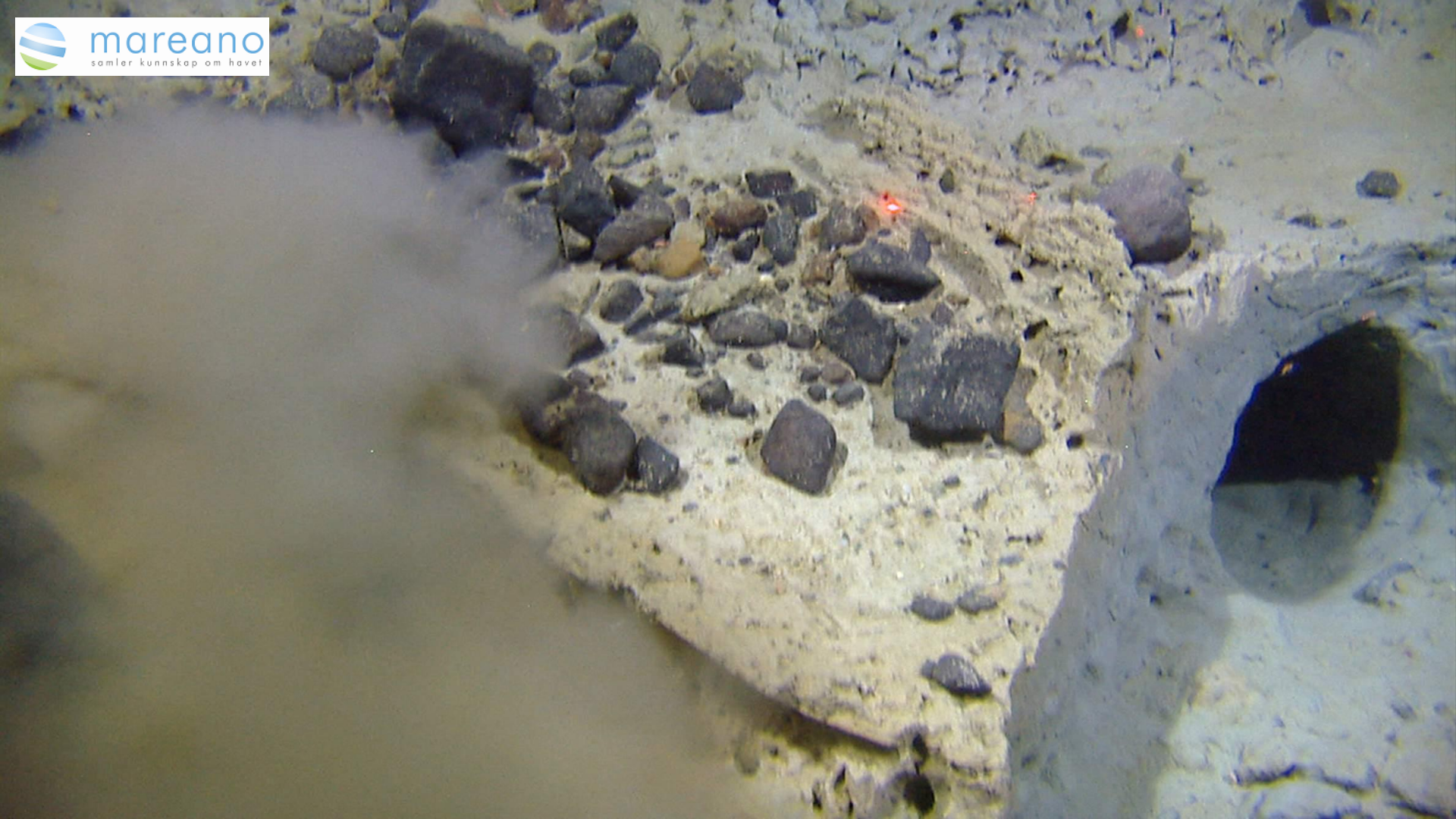




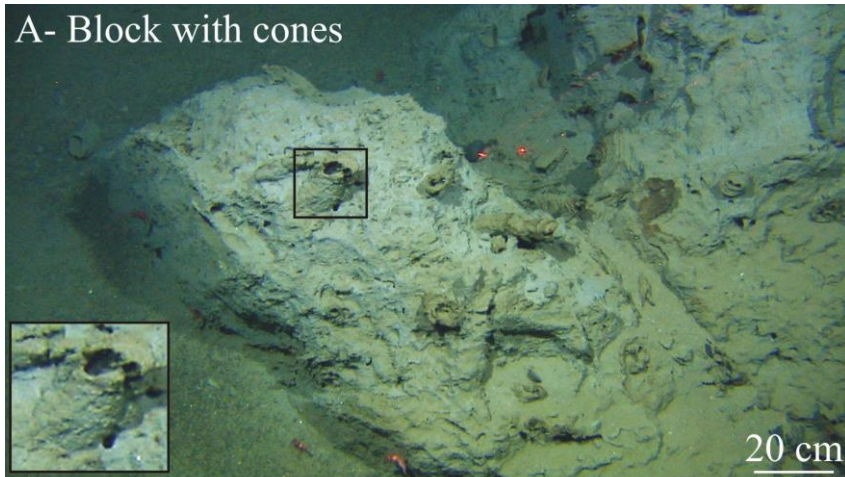


Flere hundre millioner pockmark
på norsk sokkel

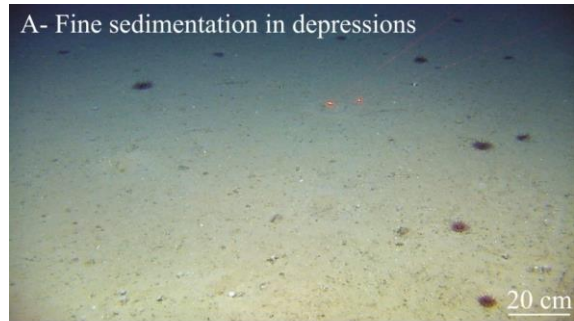




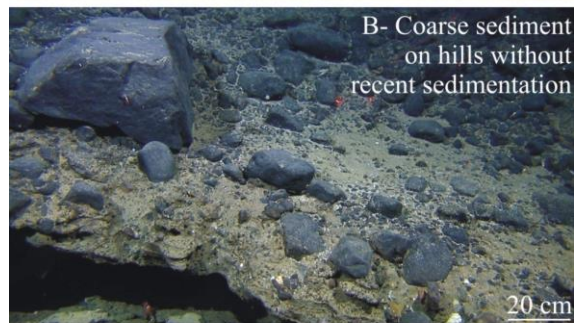
A- Block with cones



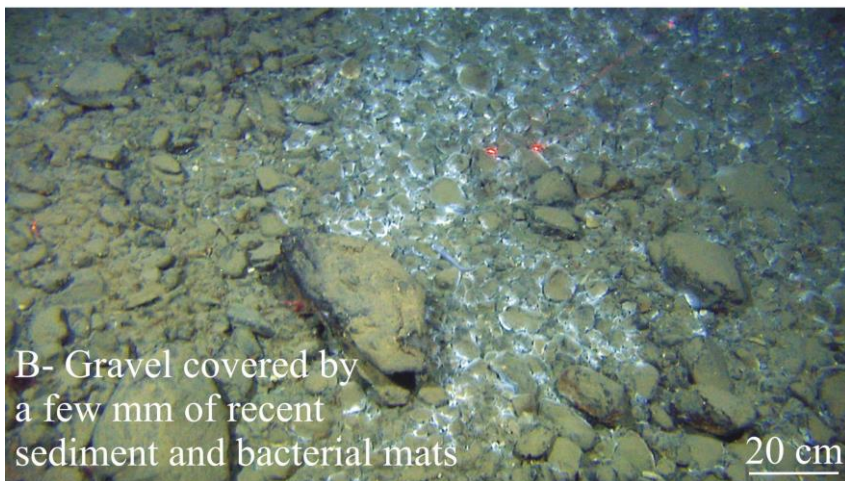
A- Fine sedimentation in depressions



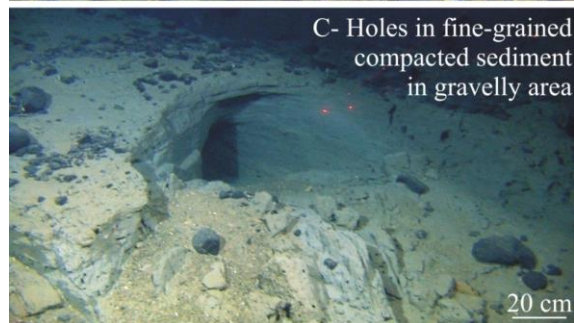
B- Coarse sediment
on hills without
recent sedimentation



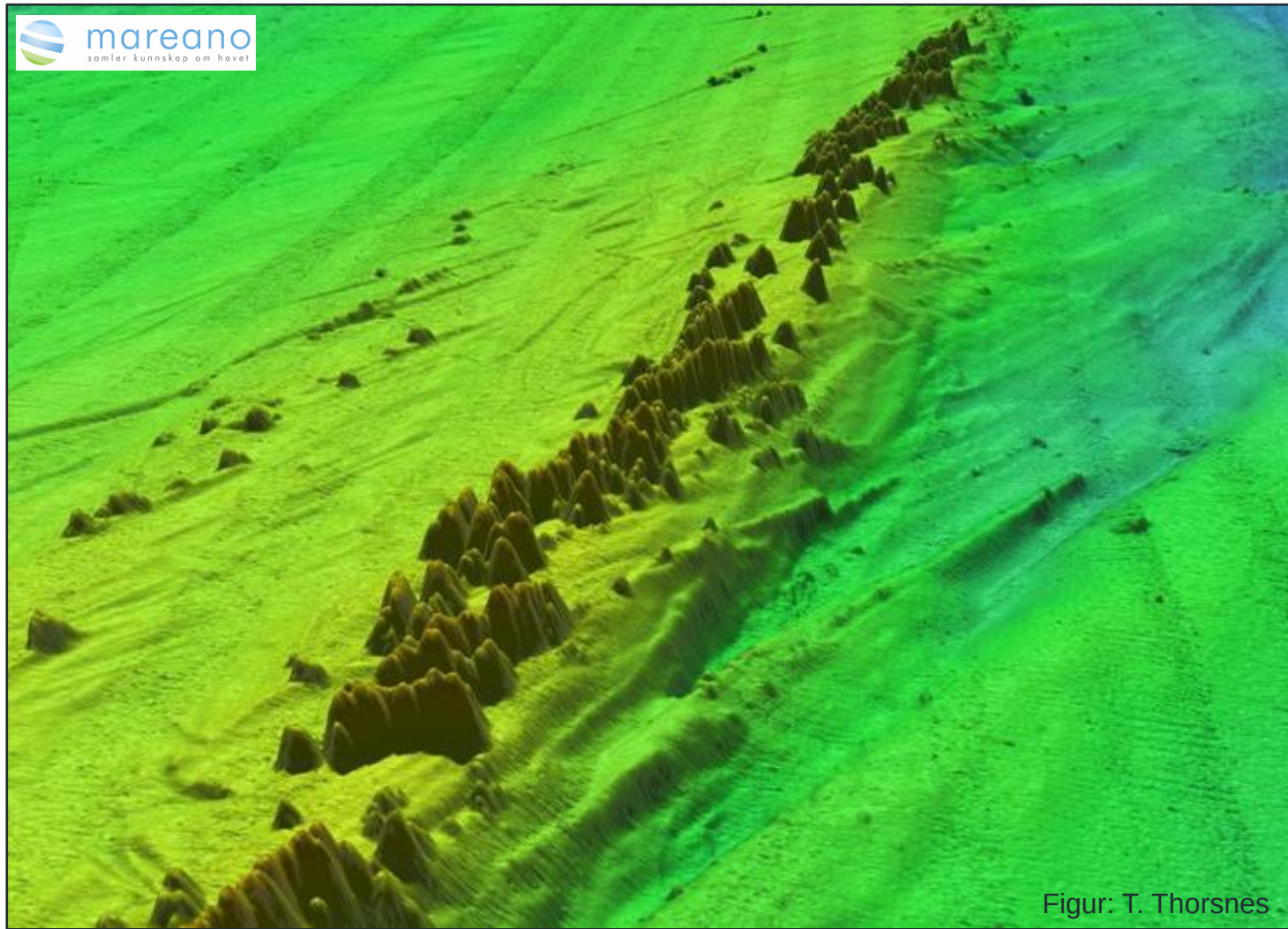
B- Gravel covered by
a few mm of recent
sediment and bacterial mats



C- Holes in fine-grained
compacted sediment
in gravelly area



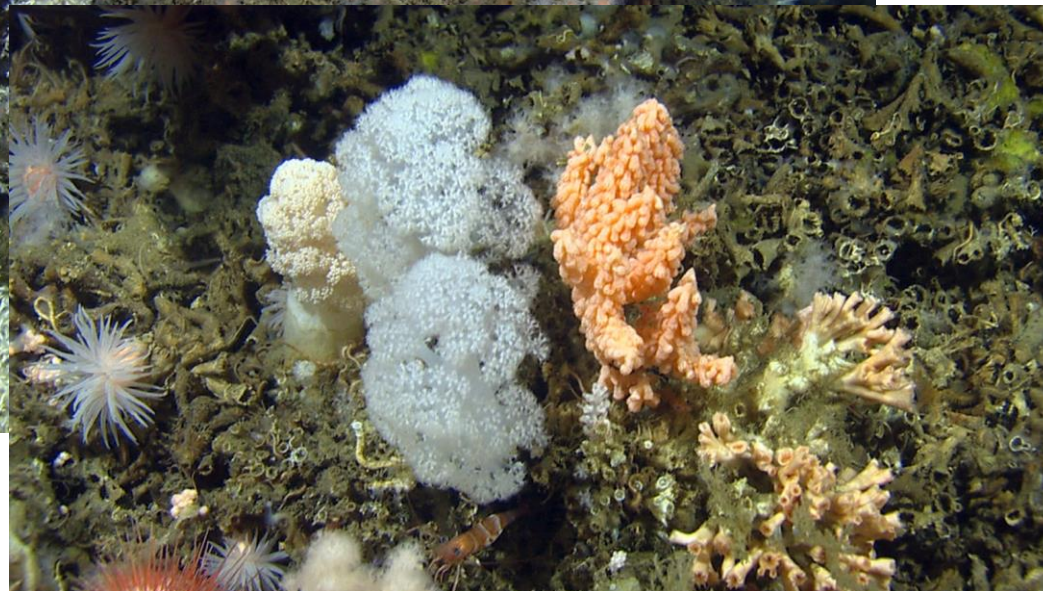
Figur: R. Bøe



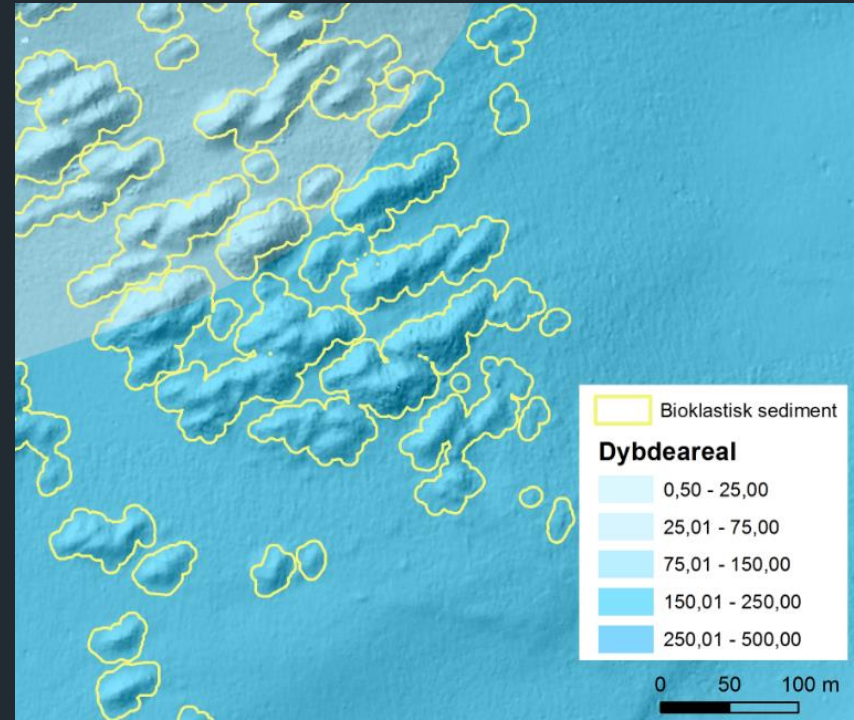
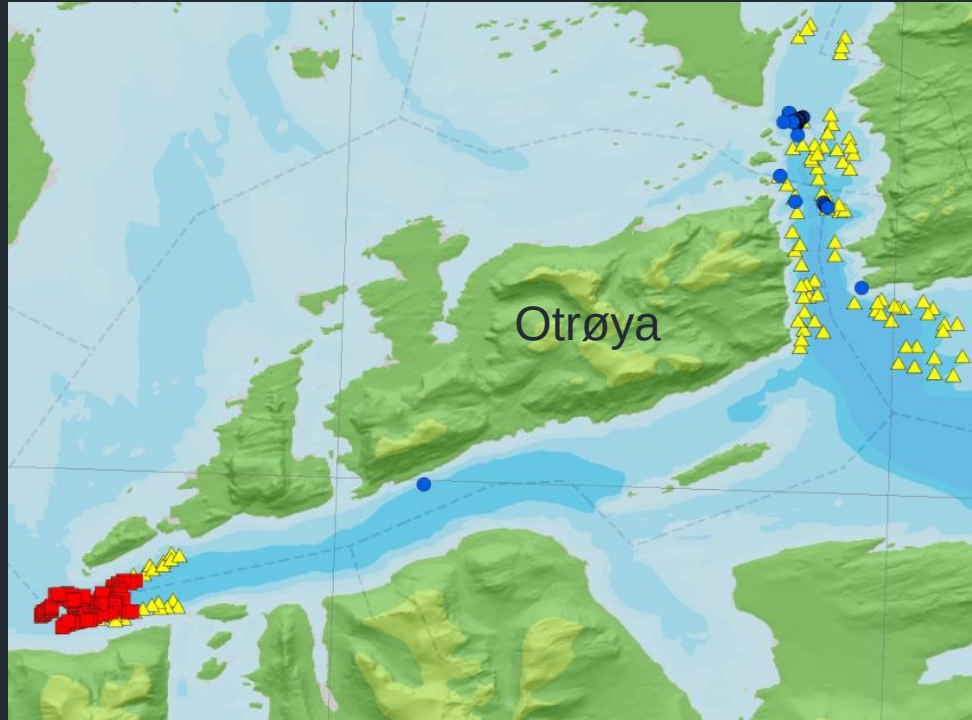
Figur: T. Thorsnes



Korallrev i Holarålen, Vesterålen



Korallrev i Romsdalsfjorden



Jarna et al. (2017)



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Vesterålsgrunnen

Korallrev

Sandbølger



Søren Vaulen. Foto: Eiliv Leren / terrengmodell: Kartverket

**Budsjett 3,5 milliarder kroner –
samfunnsøkonomisk analyse viser
at investeringen er inntjent
på 1 år når kartleggingen er fullført**

Marine grunnkart i kystsonen

Fra pilot til nasjonalt program





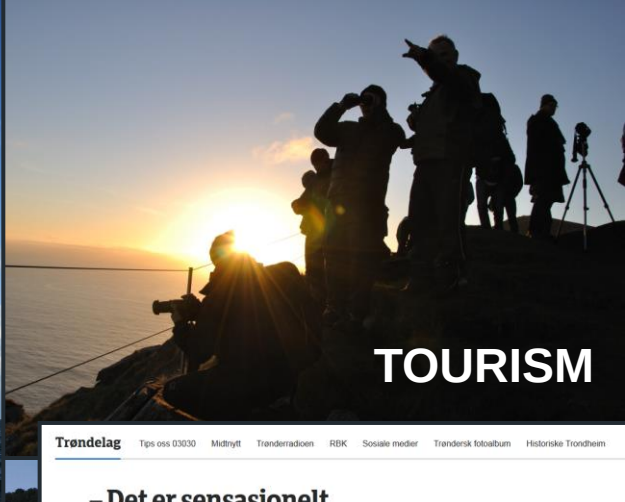
FISHERIES



NAVIGATION



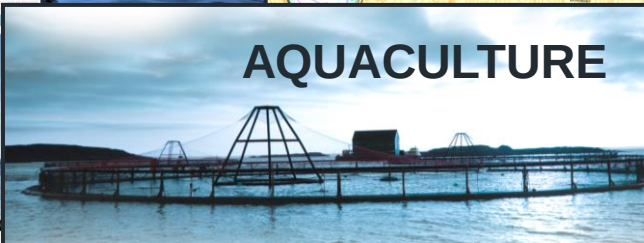
WIND POWER



TOURISM



INFRA-STRUCTURE



AQUACULTURE

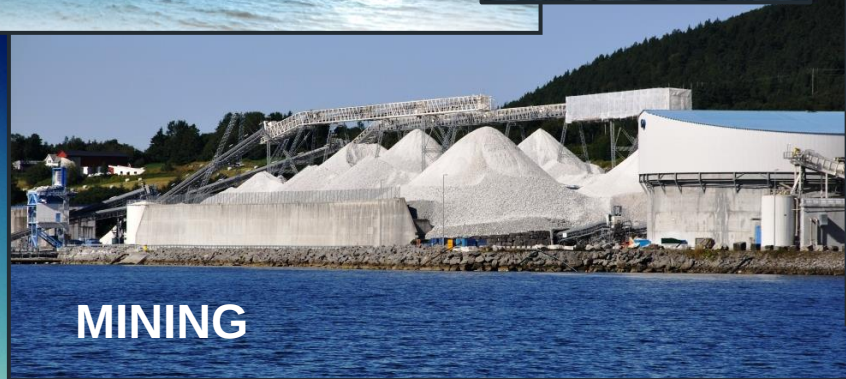
Brekstad - Trondheim på 40 minutter

Det er drømmen og det konkrete målet for et nyetablerte buselskap som skal jobbe videre med å bygge bru over Trondheimsfjorden.

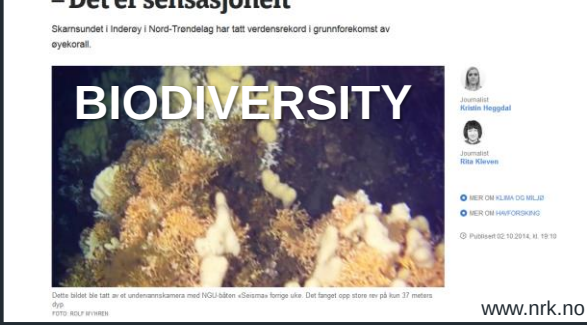


RECREATION

Photo: Mikal Nerberg

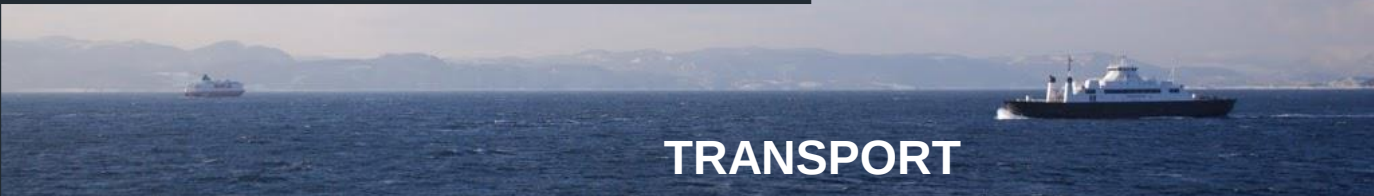


MINING



BIODIVERSITY

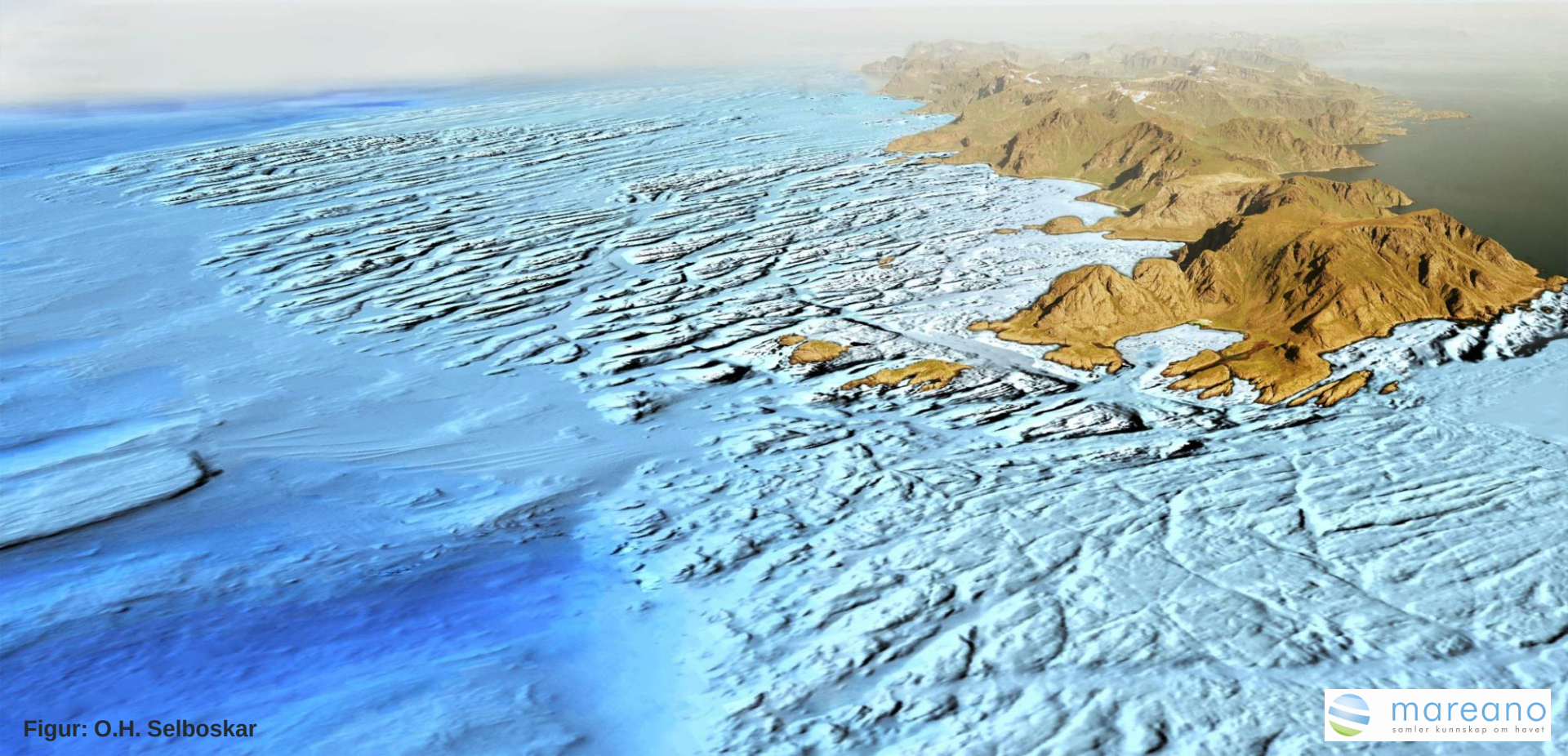
www.nrk.no



TRANSPORT



Strandflata utenfor Lofoten

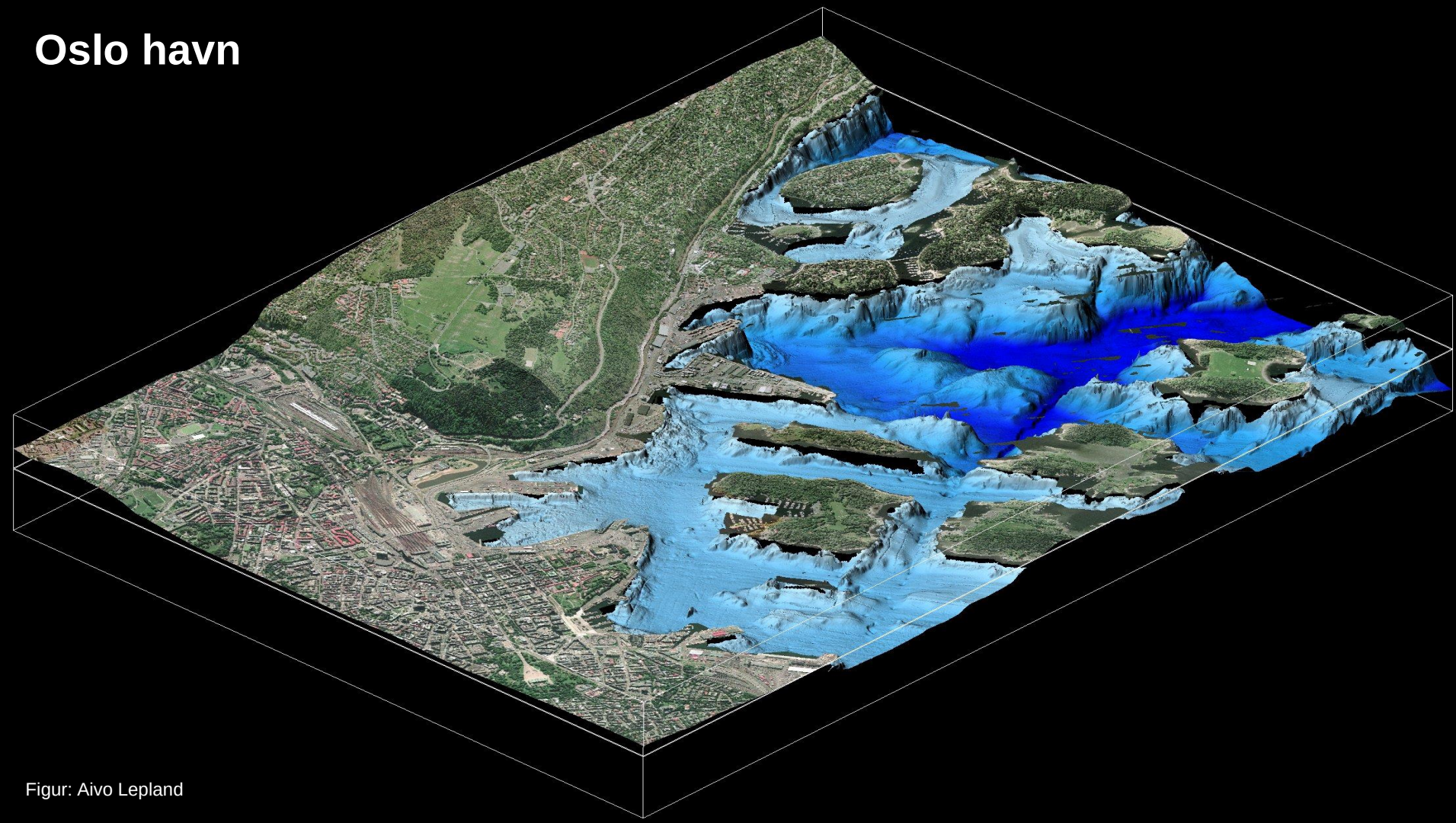


Tafjord



Figur: O.H. Selboskar

Oslo havn



Vikna - Norge i bilder

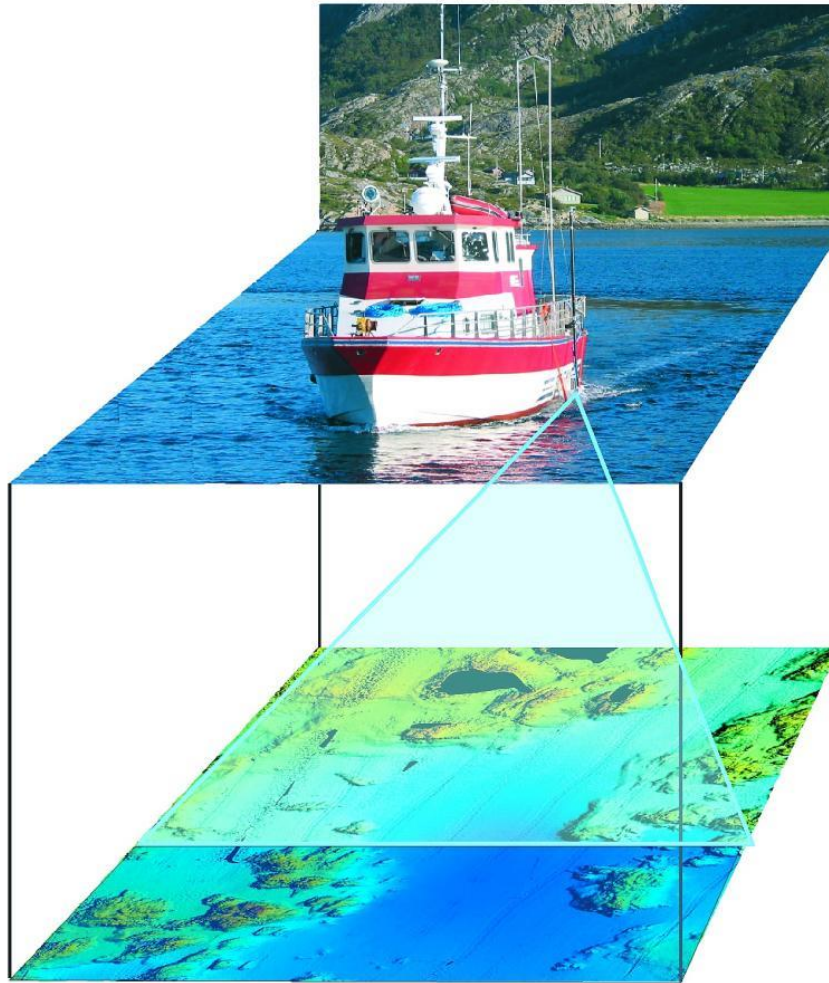


Skjellsand – naturtype og ressurs





Foto: Reidulv Bøe

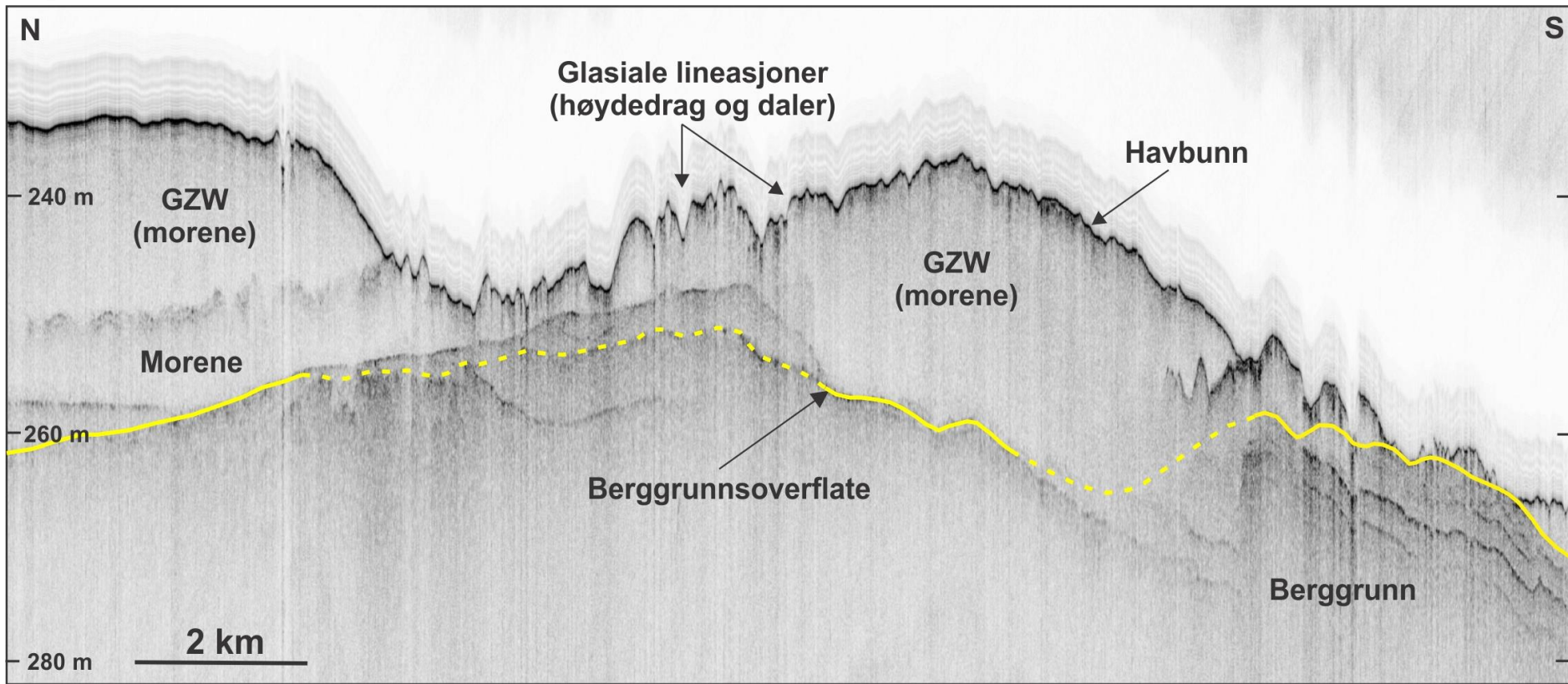


Framstilling av Marine grunnkart

**Multistråleekkolodd
Sedimentekkolodd
Seismikk
Prøvetaking
Fotografering/filming
Sedimentanalyser**

**Tolkning
Modellering**

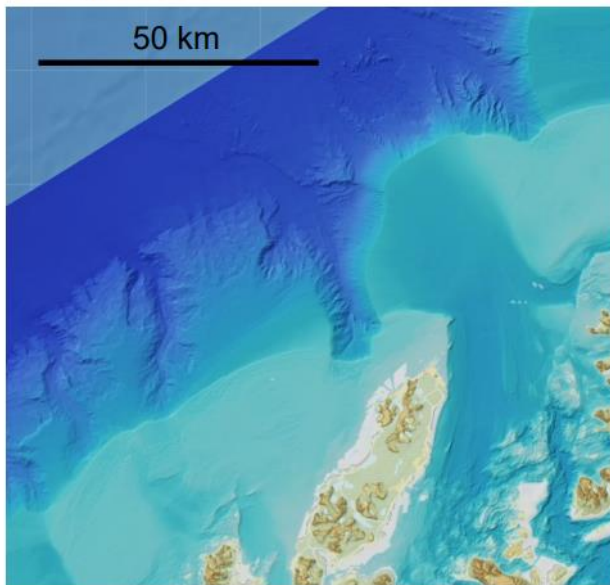




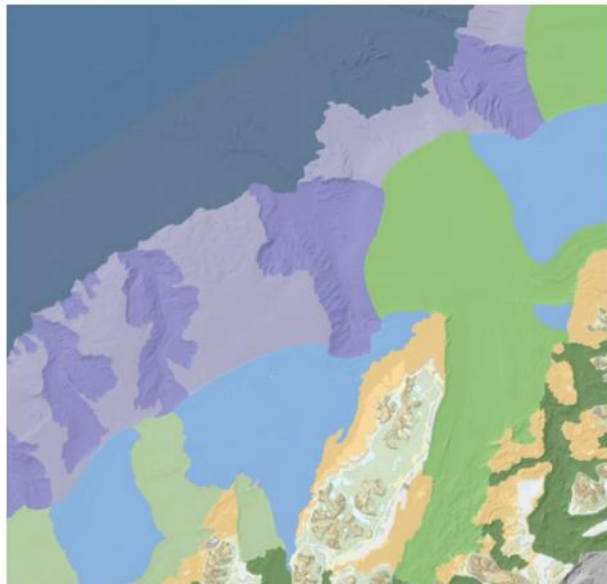
NGU har database over grunnseismikk og ansvar for prosessering og tolkning av seismiske data for kartlegging av geologiske forhold på og under havbunnen

Landskaper og landformer

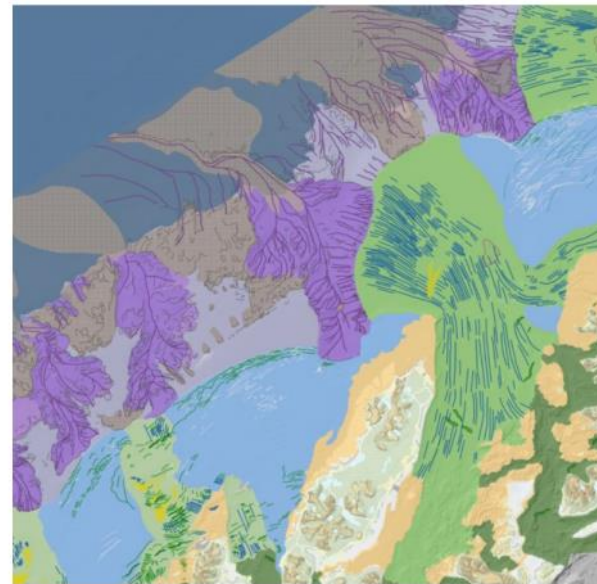
Batymetri

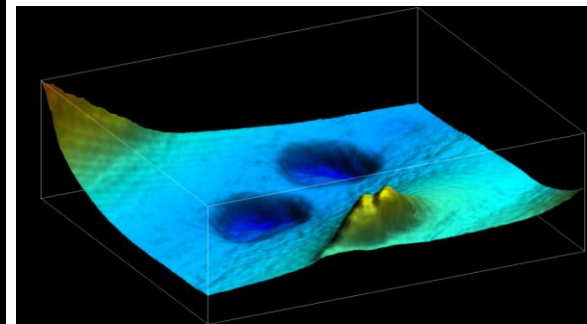
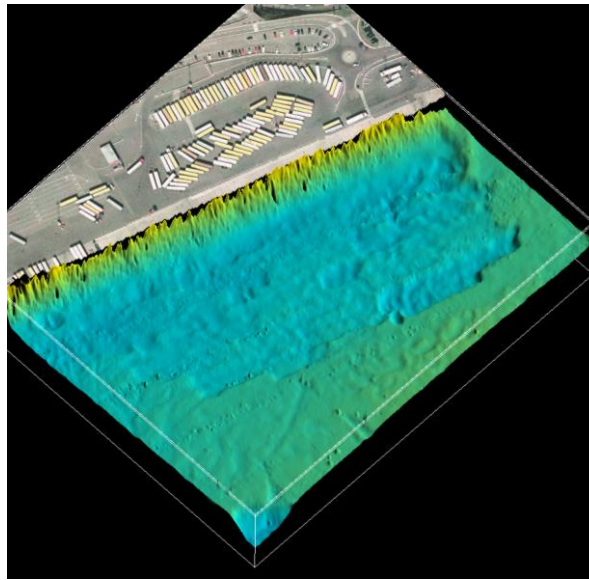
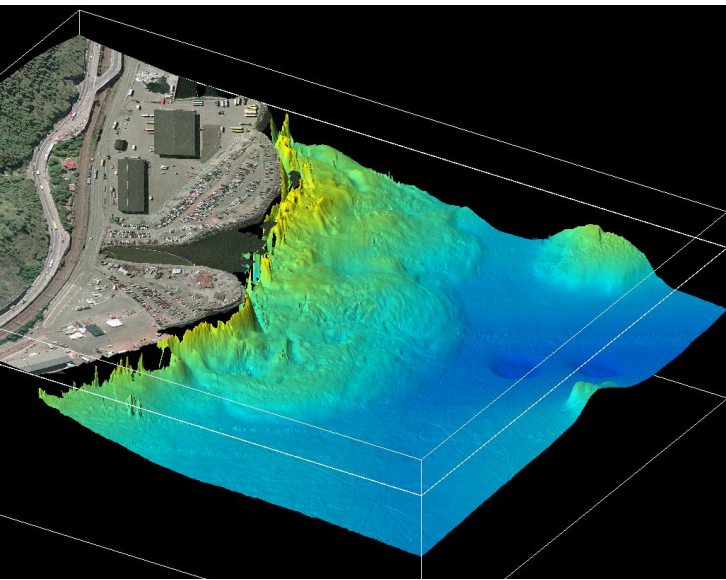
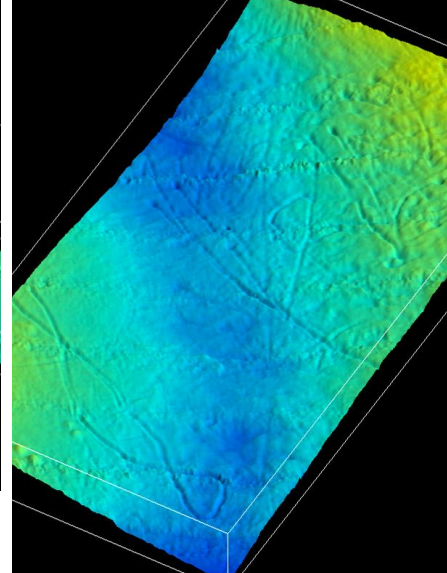
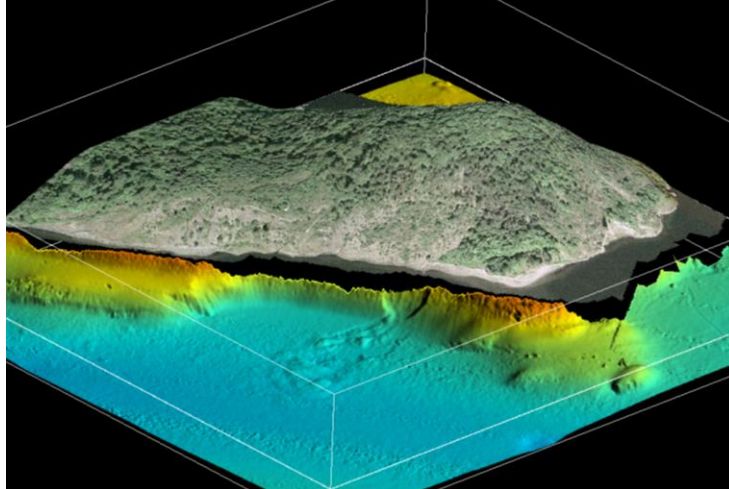
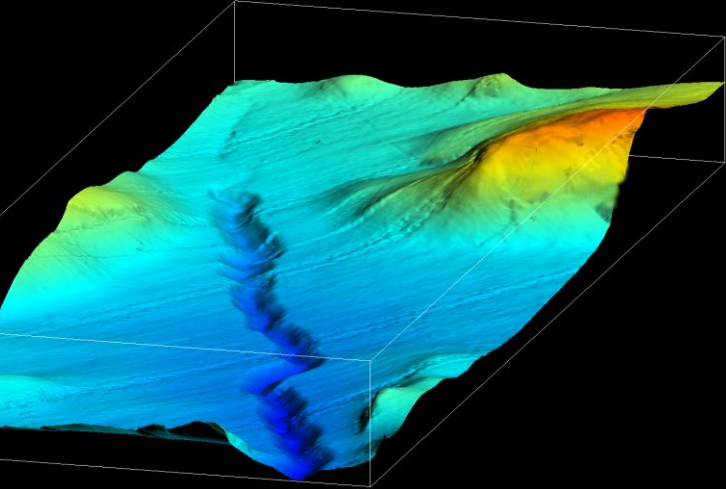


Landskap, basert på NiN

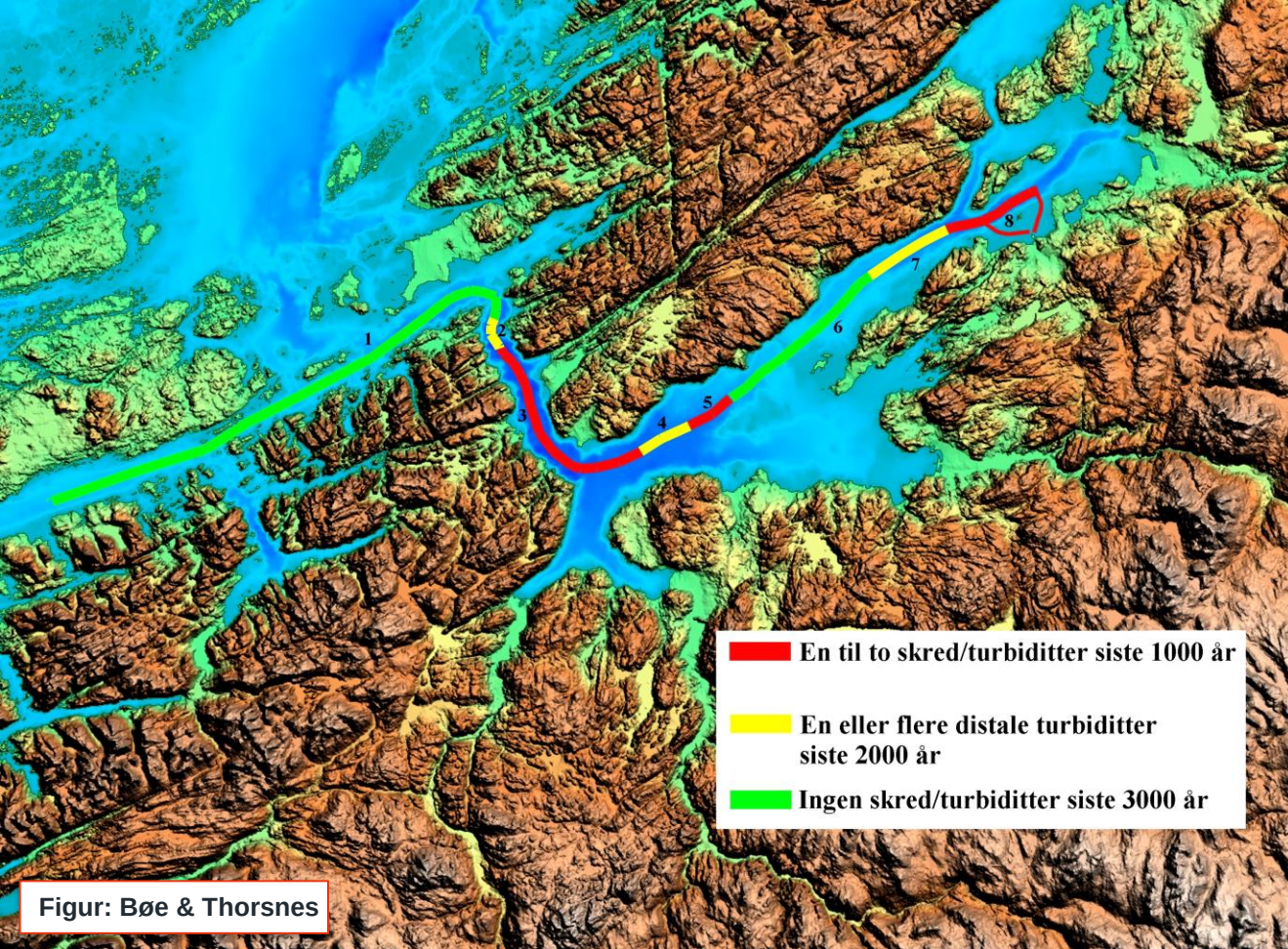


Landskap og landformer

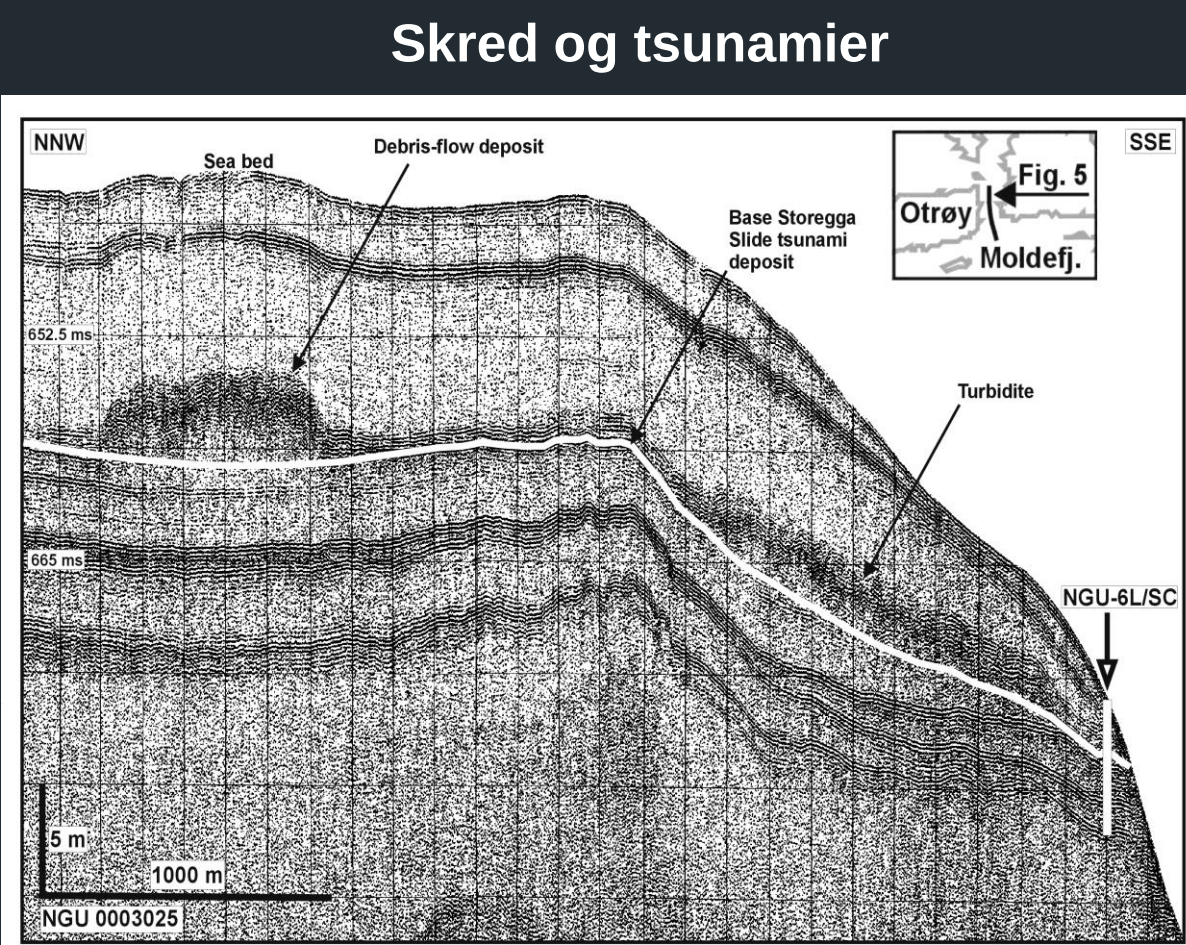
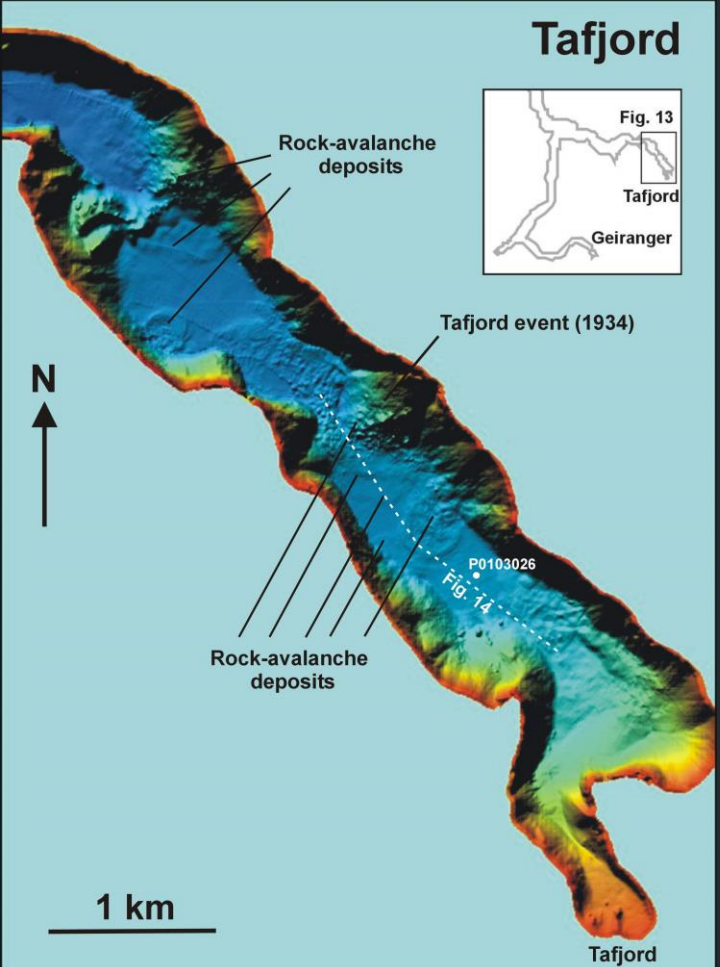




Undersjøiske skred og skredfare kartlagt i flere prosjekter

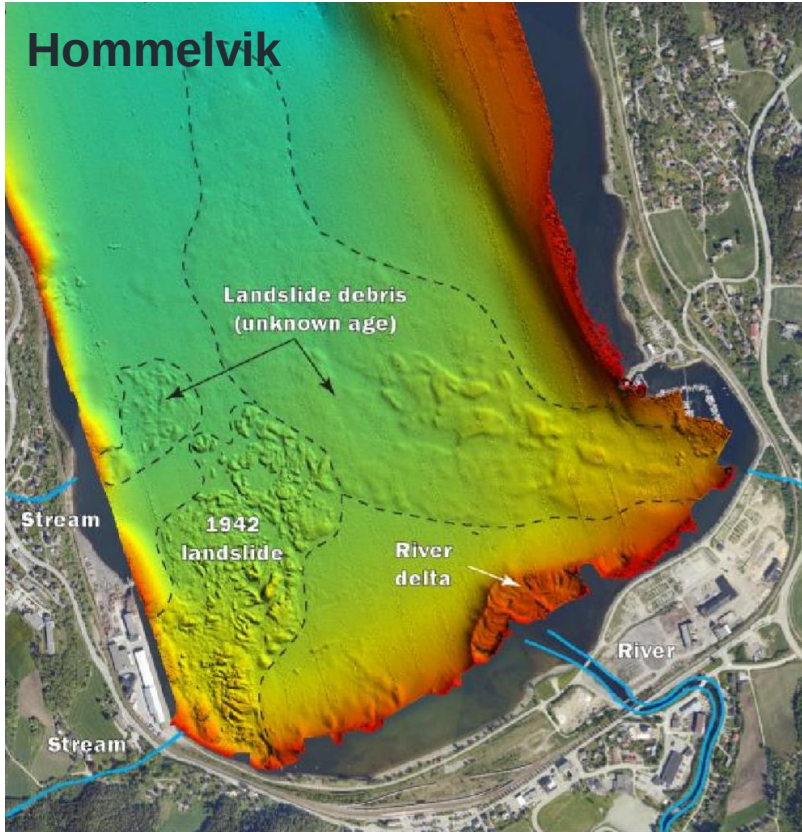


Figur: Bøe & Thorsnes

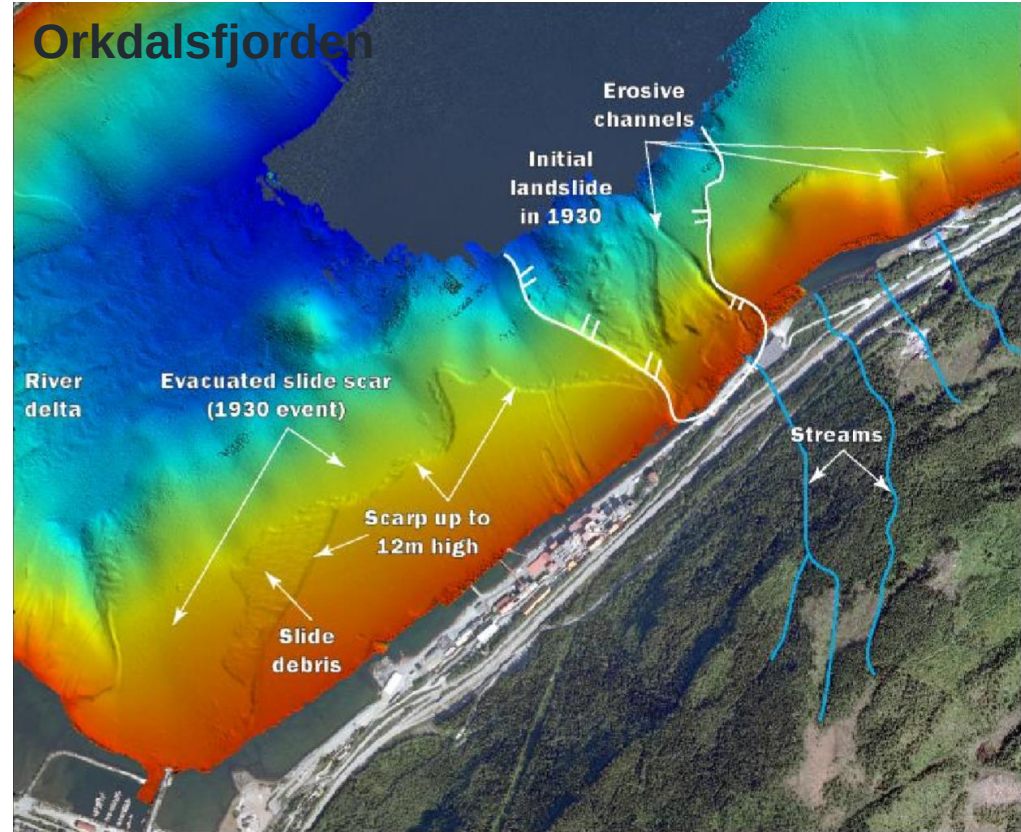


Figur: Reidulv Bøe

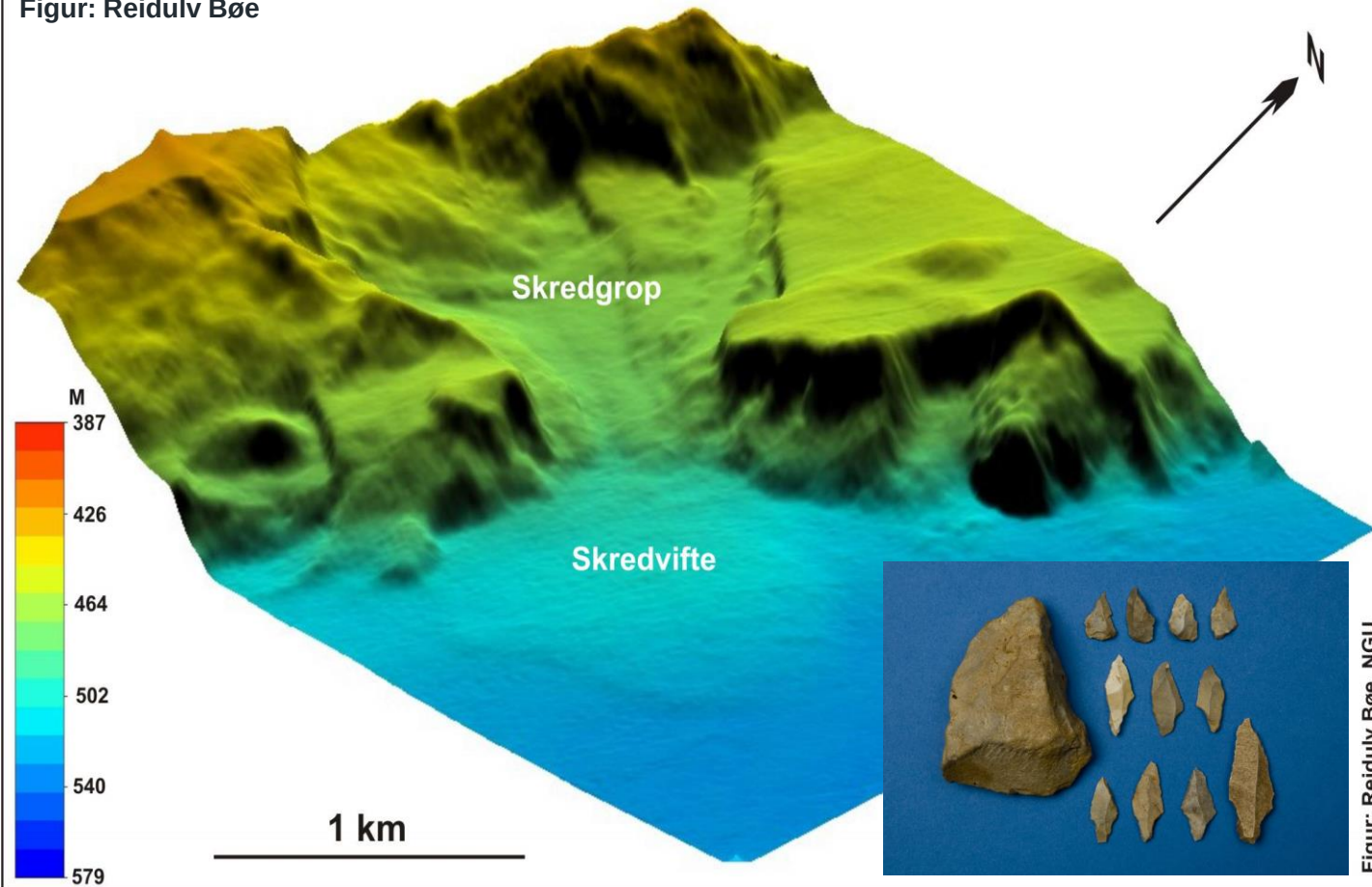
Samfunnssikkerhet og samferdsel – skred i strandsonen



L'Heureux et al. (2011)



Figur: Reidulv Bøe



Figur: Reidulv Bøe, NGU

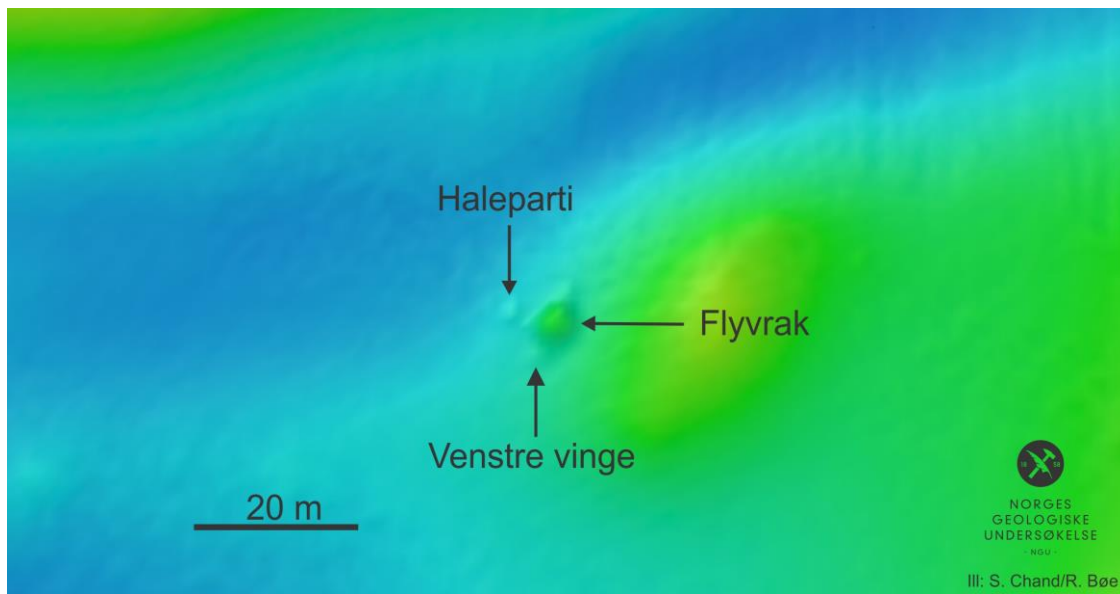




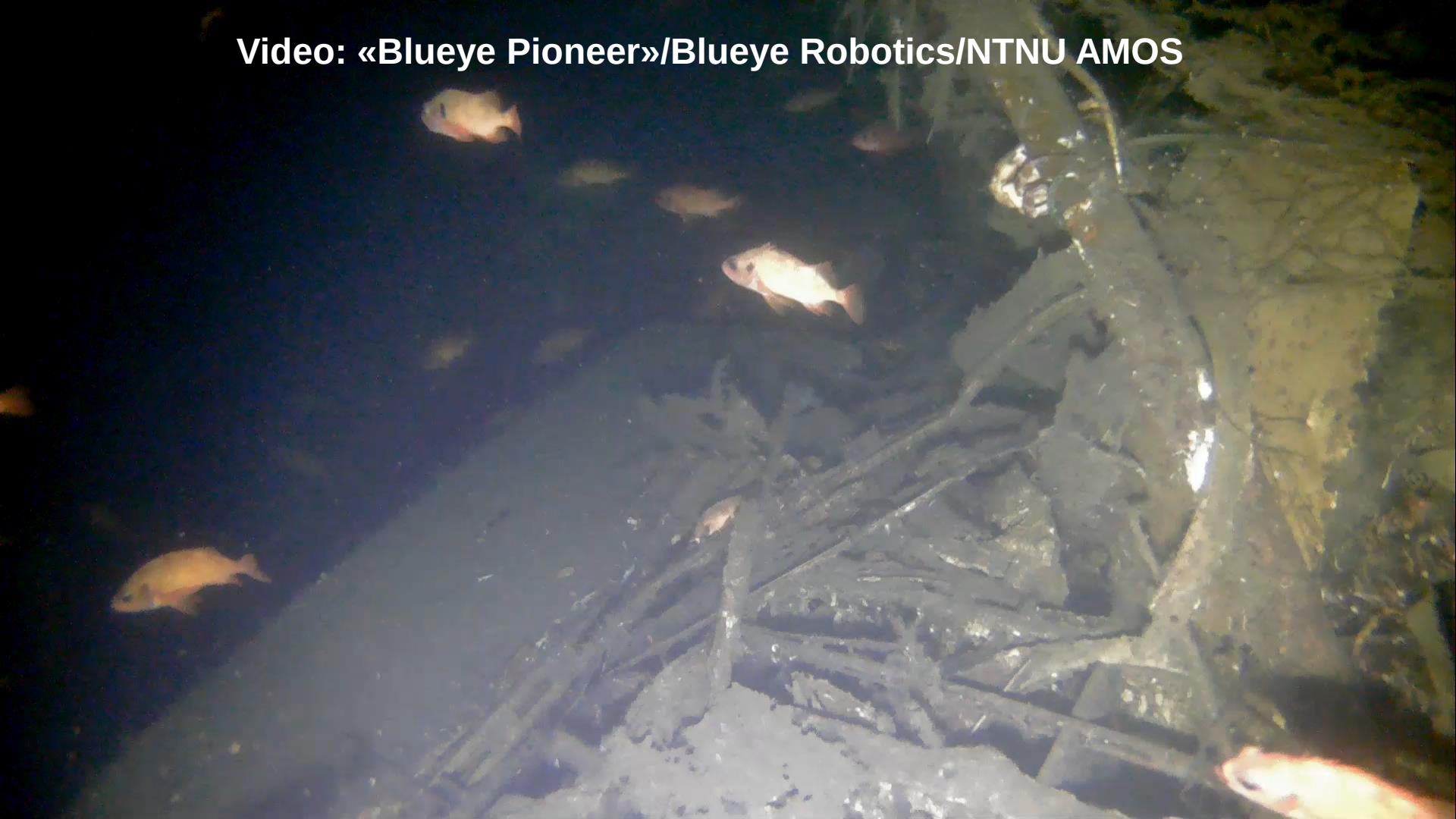
Vrak



Arado Ar 196



Video: «Blueye Pioneer»/Blueye Robotics/NTNU AMOS



Nabbaren

Deponering av gruveavgang og andre masser

Lillebukt vannet

A

B

C

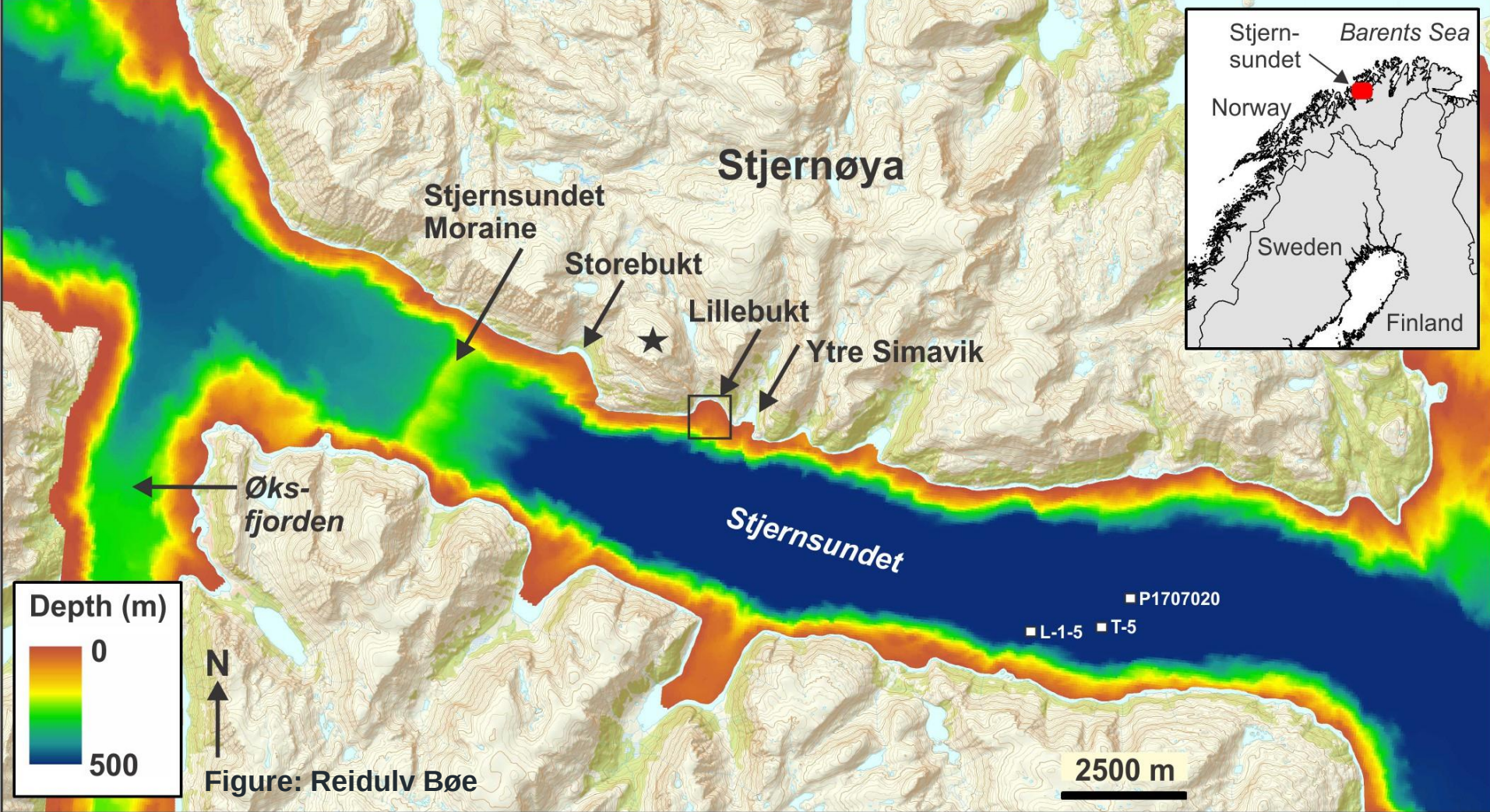
D

Stjernesundet

Bøe et al. (2018)



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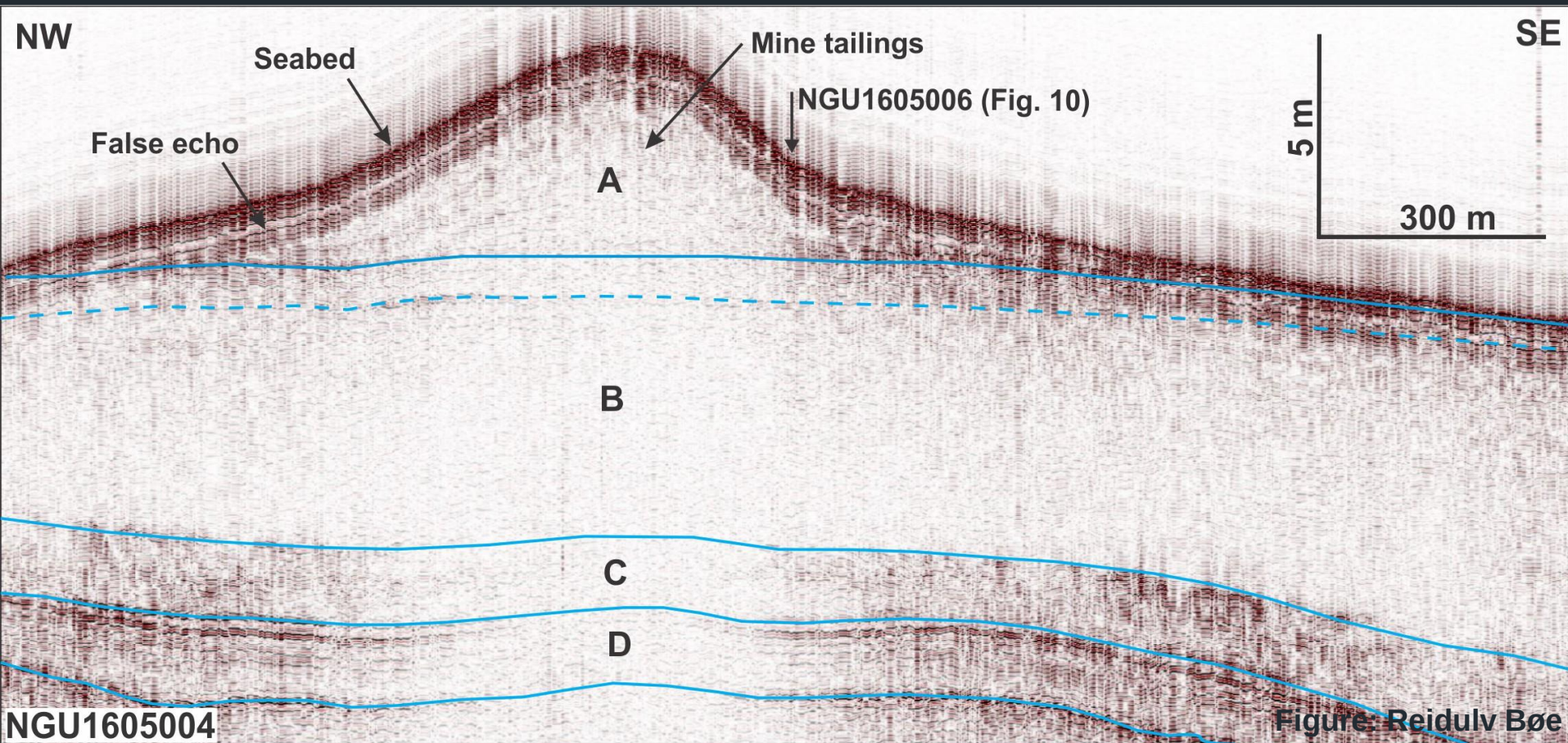
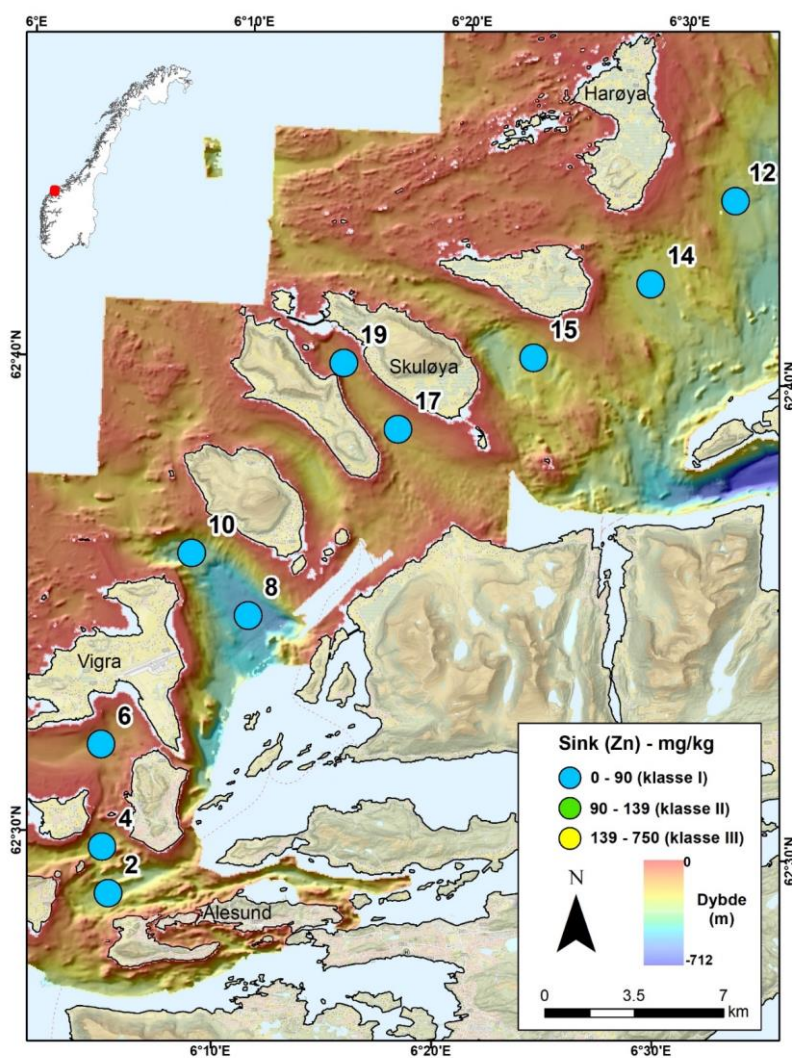


Figure: Reidulv Bøe

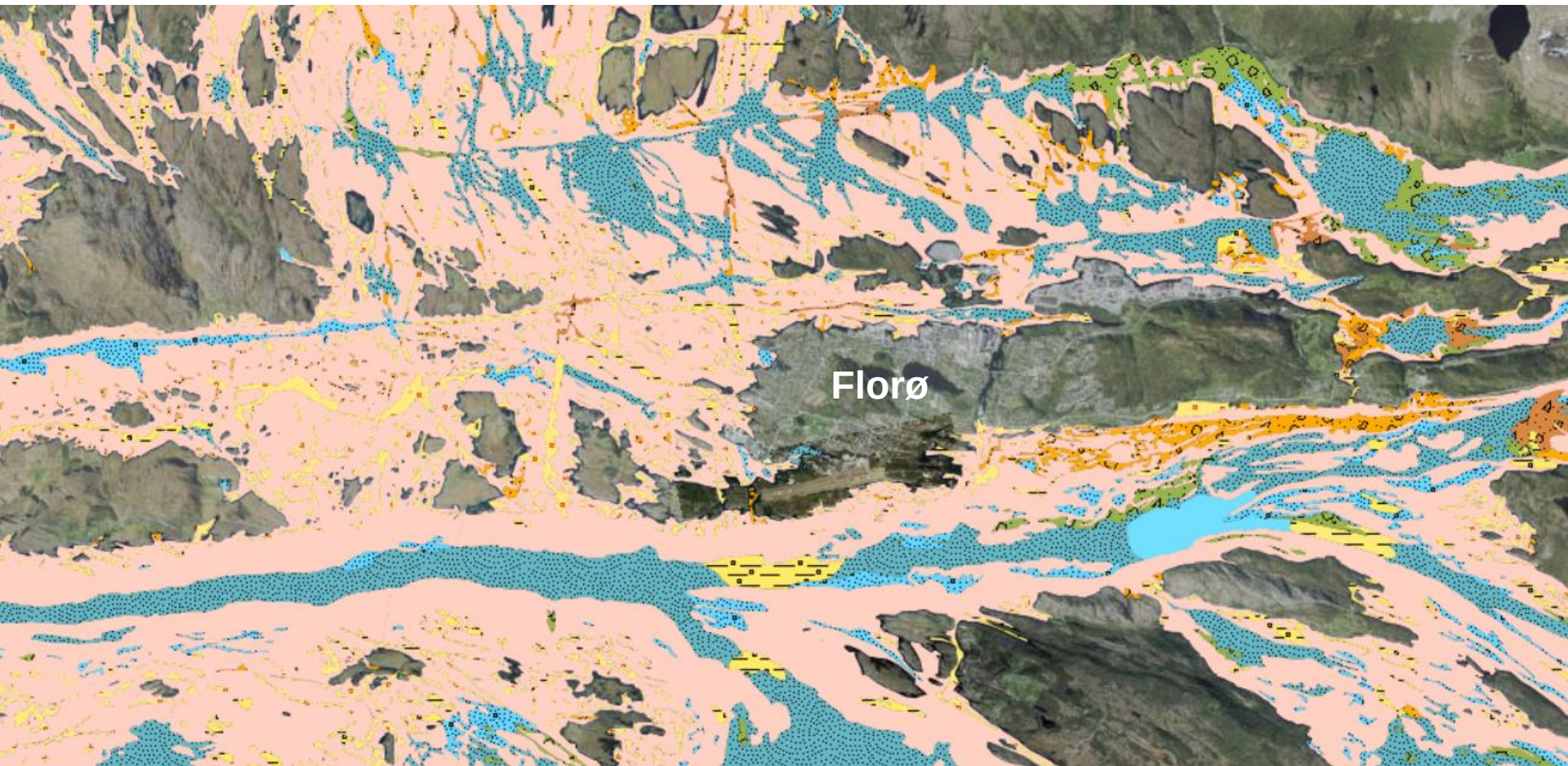


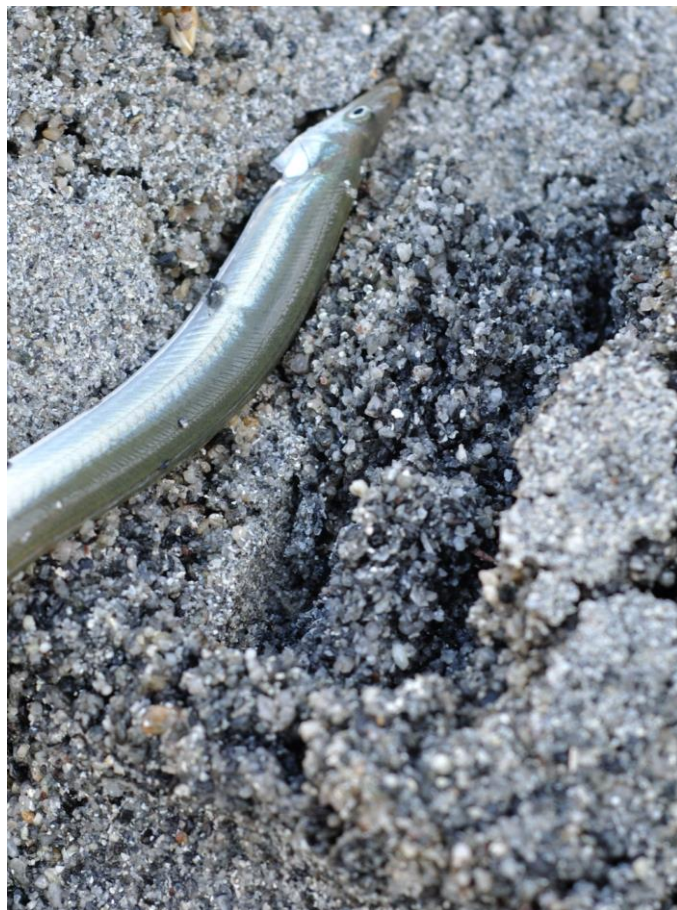
I Bakgrunn	II God	III Moderat	IV Dårlig	V Svært dårlig
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Miljøtilstand i henhold til Miljødirektorates klassifisering

Knies m. flere (2021)
NGU-Rapport 2021.018

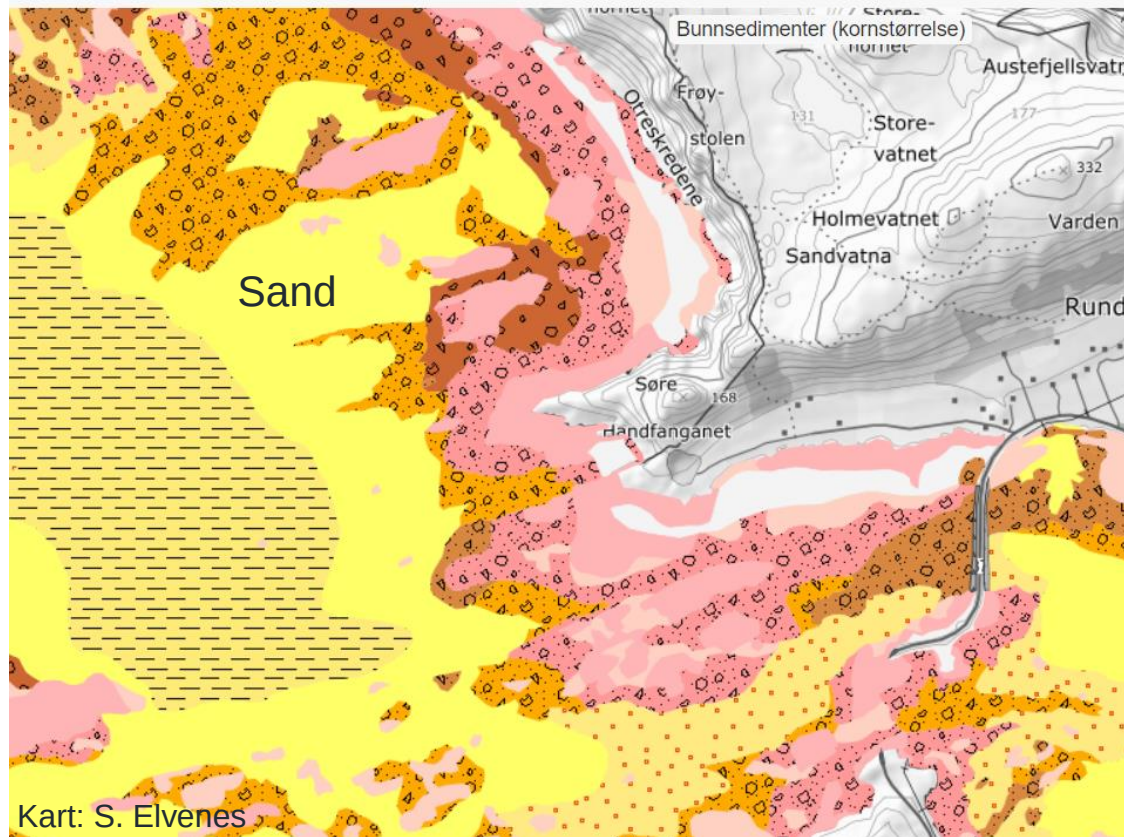
Bunnsedimenter (kornstørrelse) – øverste ca. 10 cm av havbunnen
Danner grunnlag for blant annet naturtypekart og flere avledede kart



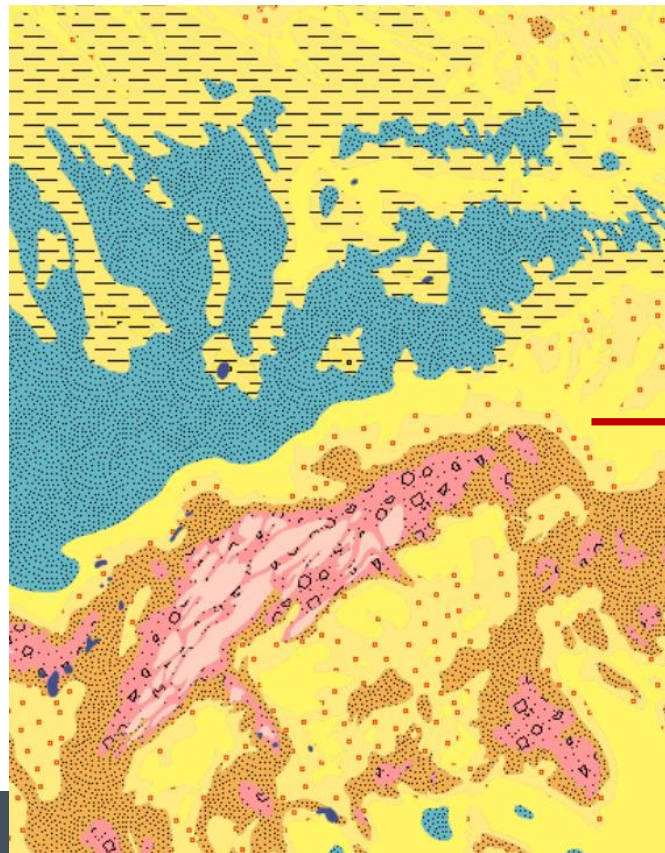


Sand og grus

MARINE KART



Marine kart på fiskernes kartplottere: Kunnskap bidrar til mer effektivt og bærekraftig fiske

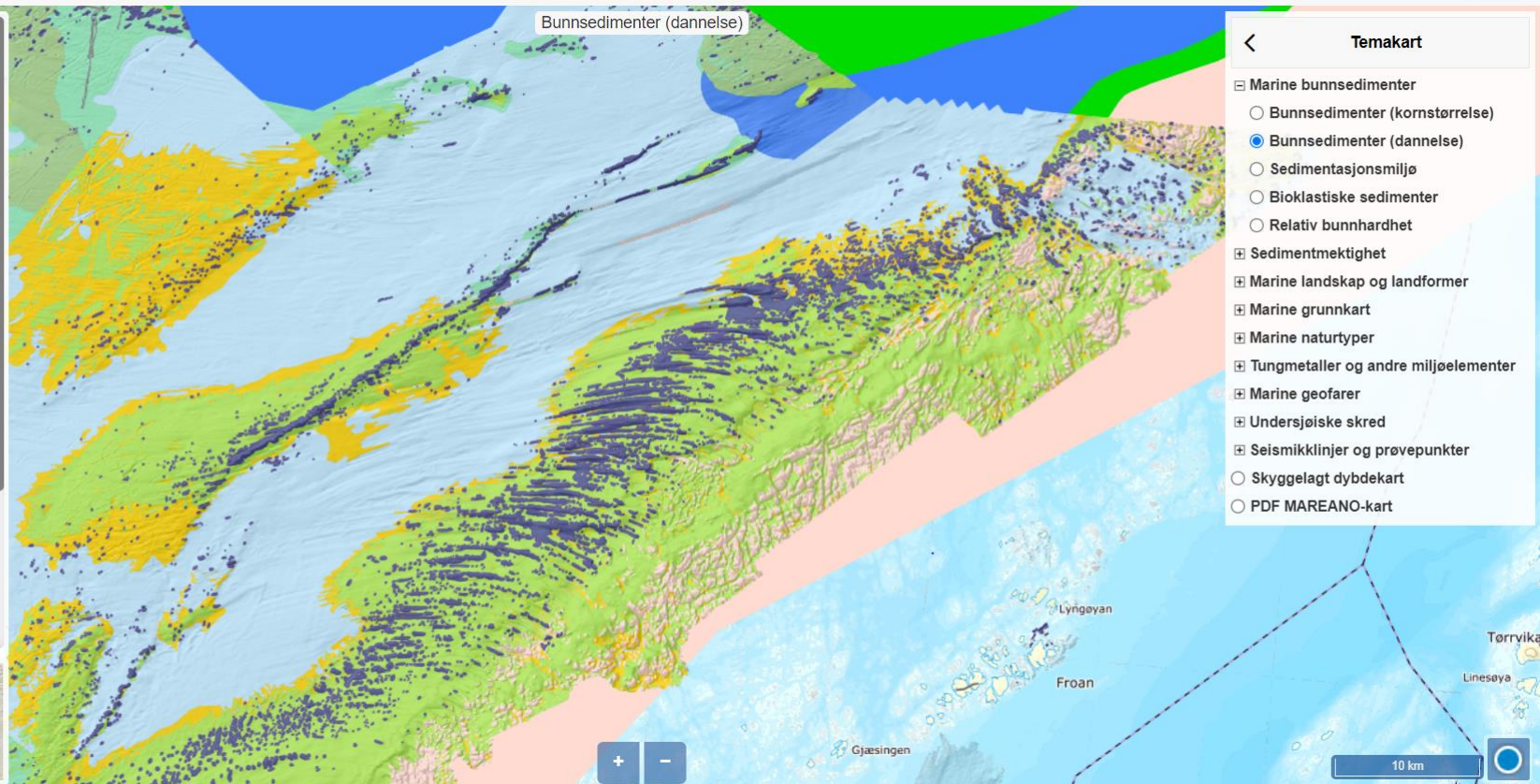


NC



Bunnsedimenter (dannelse)

- Marin suspensjonsavsetning
- Glasimarin avsetning
- Strandavsetning, sammenhengende
- Grunnmarin avsetning
- Marin bunnstrømsavsetning
- Konturittavsetning
- Kanalavsetning
- Breelavsetning
- Morenemateriale, uspesifisert
- Morenemateriale, tykt dekke
- Morenemateriale, tynt dekke over
- Randmorenerygg/Randmorenebe
- Iskontaktavsetning
- Morene med tynt dekke av glasim
- Morene med tynt dekke av finkorr
- Debrisstrømsavsetning
- Lagdelt sediment over debrisstr
- Skredmateriale, ikke inndelt i mek
- Skredmateriale, sammenhengende
- Skredmateriale, usammenhengende
- Skredmateriale, dekket av yngre se
- Skredmateriale, delvis dekket av yr
- Skredmateriale og hemipelagiske i
- Bioklastisk avsetning
- Marin gytje
- Karbonatskorper
- Harde sediment eller sedimentæ



Temakart

- Marine bunnsedimenter
 - Bunnsedimenter (kornstørrelse)
 - Bunnsedimenter (dannelse)**
 - Sedimentasjonsmiljø
 - Bioklastiske sedimenter
 - Relativ bunnhardhet
- Sedimentmektighet
- Marine landskap og landformer
- Marine grunnkart
- Marine naturtyper
- Tungmetaller og andre miljøelementer
- Marine geofarer
- Undersjøiske skred
- Seismikklinjer og prøvepunkter
- Skyggelagt dybdekart
- PDF MAREANO-kart

Bunnsedimenter (dannelse)/kvartærgeologi – øverste 1-2 m av havbunnen

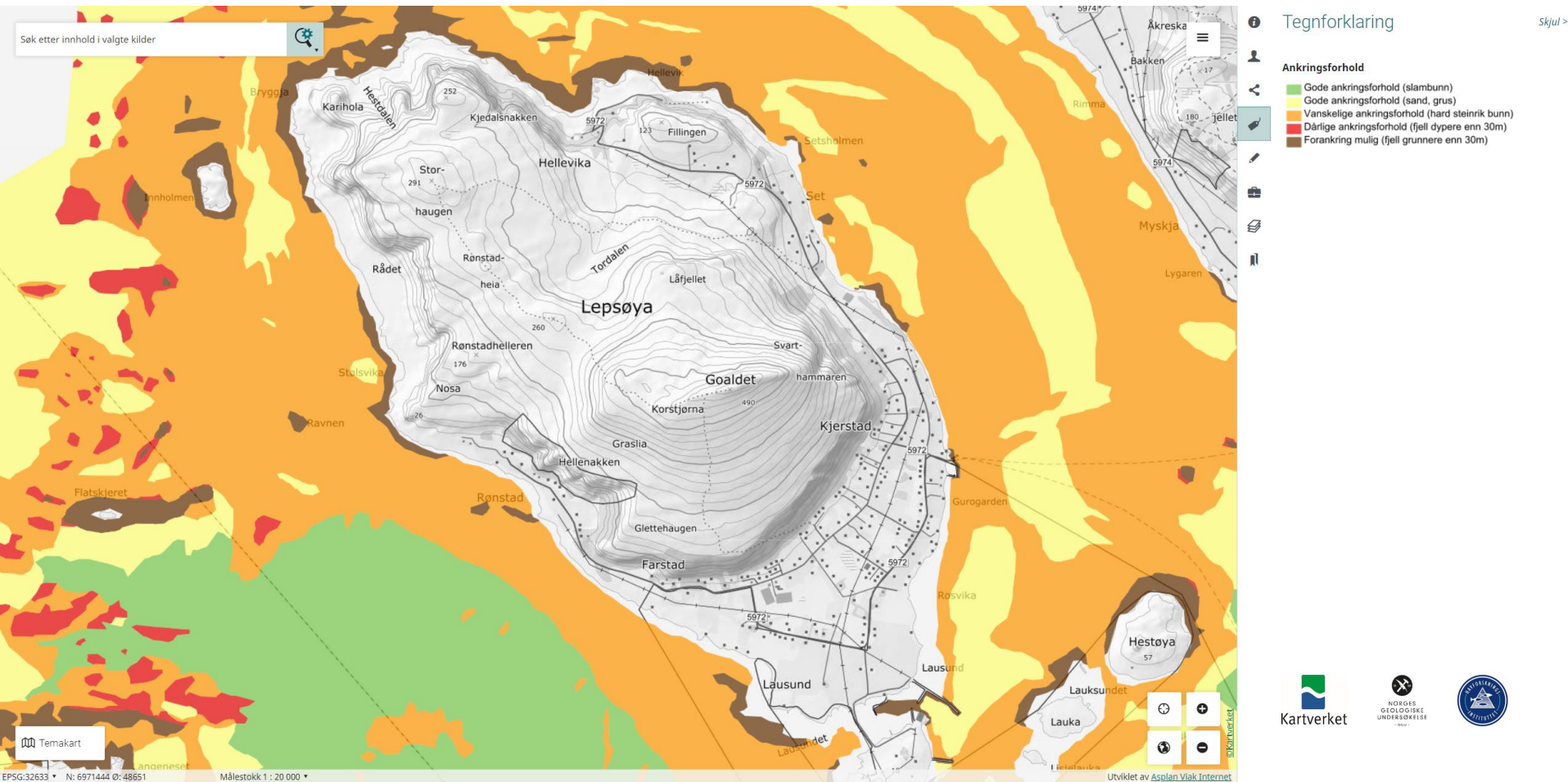




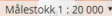
Sedimentasjonsmiljø – havbruksindustrien viktig bruker



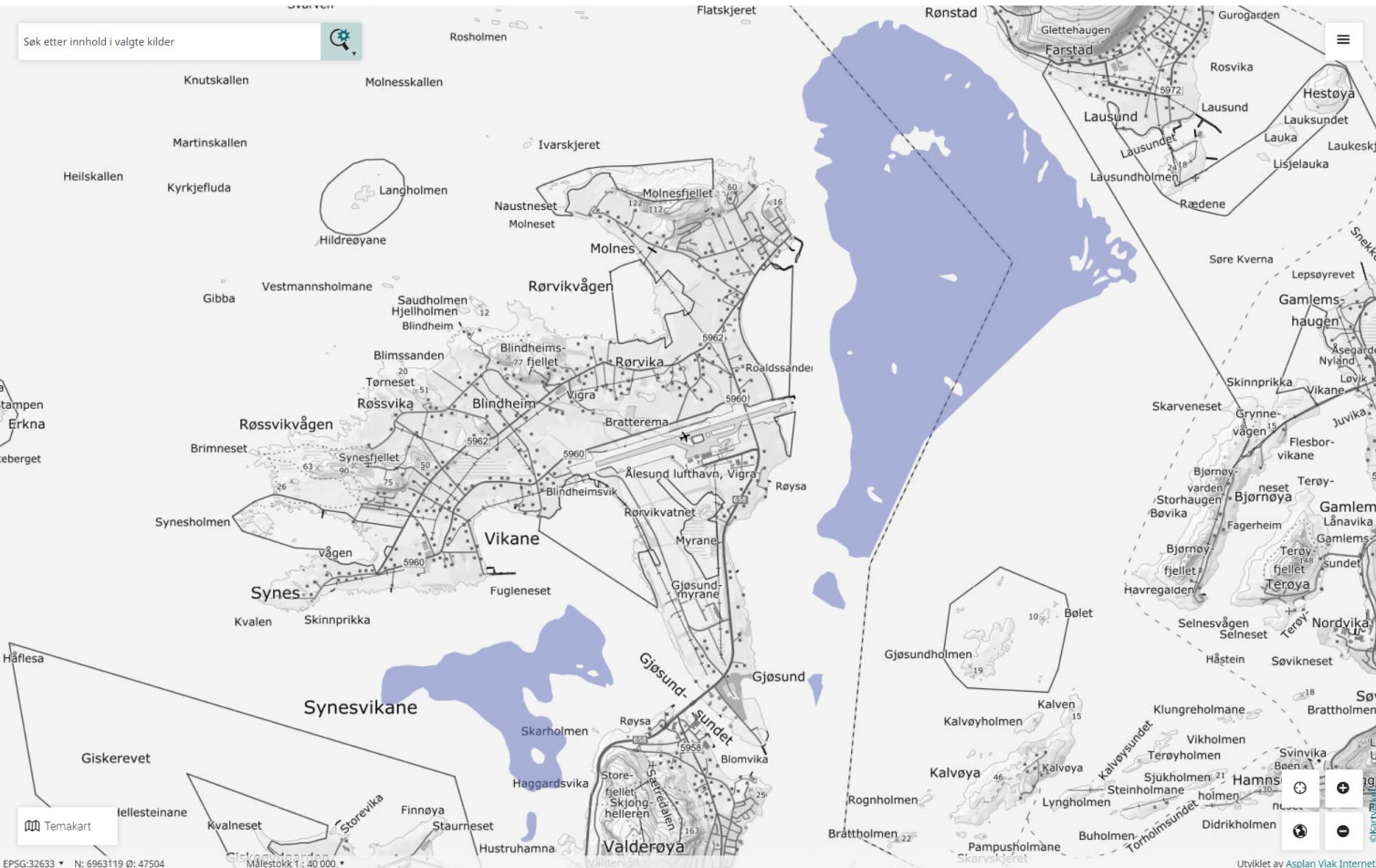
Ankringsforhold – oppdrettsanlegg, nødankring ved skipsforlis



Skjul



Bunnfellingsområder



Temalagsvelger

Skjul >

Alle temalag

ag Sorter temalag

▶ ☐ Referansedata

- ▶ ☐ Planer og reguleringer

► ☐ Naturtyper

► ☐ Fare- og hensynssoner

► ☐ Miljøtilstand

► ☐ Naturvern

► ☐ Menneskelig påvirkning

▲ ☒ Geologi og bunnforhold

☐ Bunnsedimenter (kornstørr... txt 🔍 📄 ⚙️☐ Bunnssedimenter (kornstørr... TXT ☐ Marine bunnsedimenter (kornstørrelse) ... ⚙

☐ Bunnssedimenter (dannelse)

☐ Sedimentasjonsmiljø ☐ Marine landskap ☐ Marine landformer ☐ Ankringsforhold ☐ Ankringsforhold (Sunnmøre, No... ☐ Gravbarhet ☒ Bunnfellingsområder☐ Bunnfellingsområder (Sunnmøre, N...  

Data og karttjenester

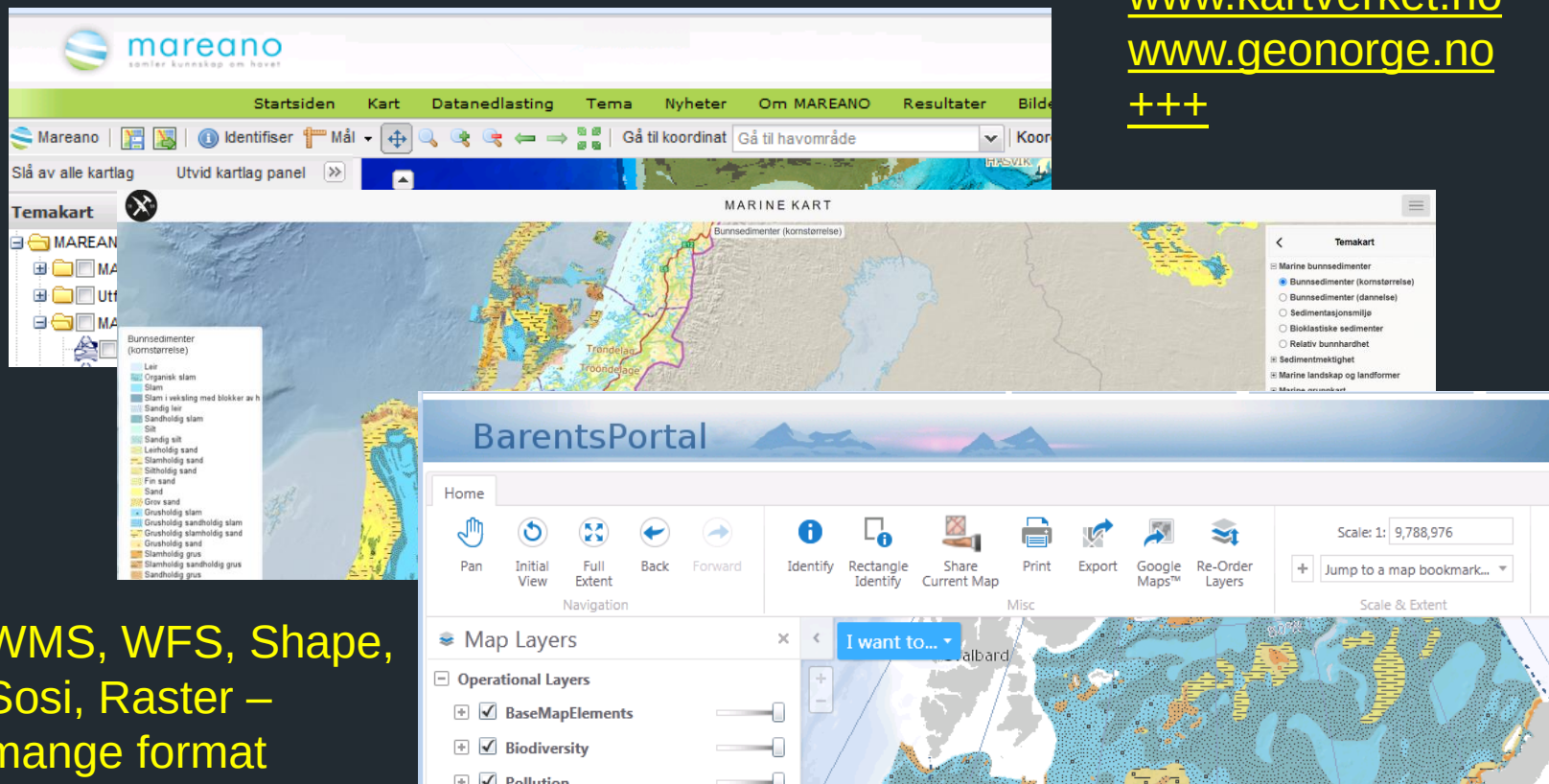
www.ngu.no

www.mareano.no

www.kartverket.no

www.geonorge.no

+++



WMS, WFS, Shape,
Sosi, Raster –
mange format



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NORGES
GEOLOGISKE
UNDERSØKELSE
- NGU -

<https://www.kewatec.com/en>



NORGES GEOLOGISKE UNDERSØKELSE
- NGU -