Setting the context for the workshop scenario planning and proposed geographic scope

Phil Weaver

Seascape Consultants

Romsey, UK

phil.weaver@seascapeconsultants.co.uk

Workshop on the Regional Environmental Management Plan for the Area of the northern Mid-Atlantic Ridge

Evora, Portugal, 25-29 November 2019

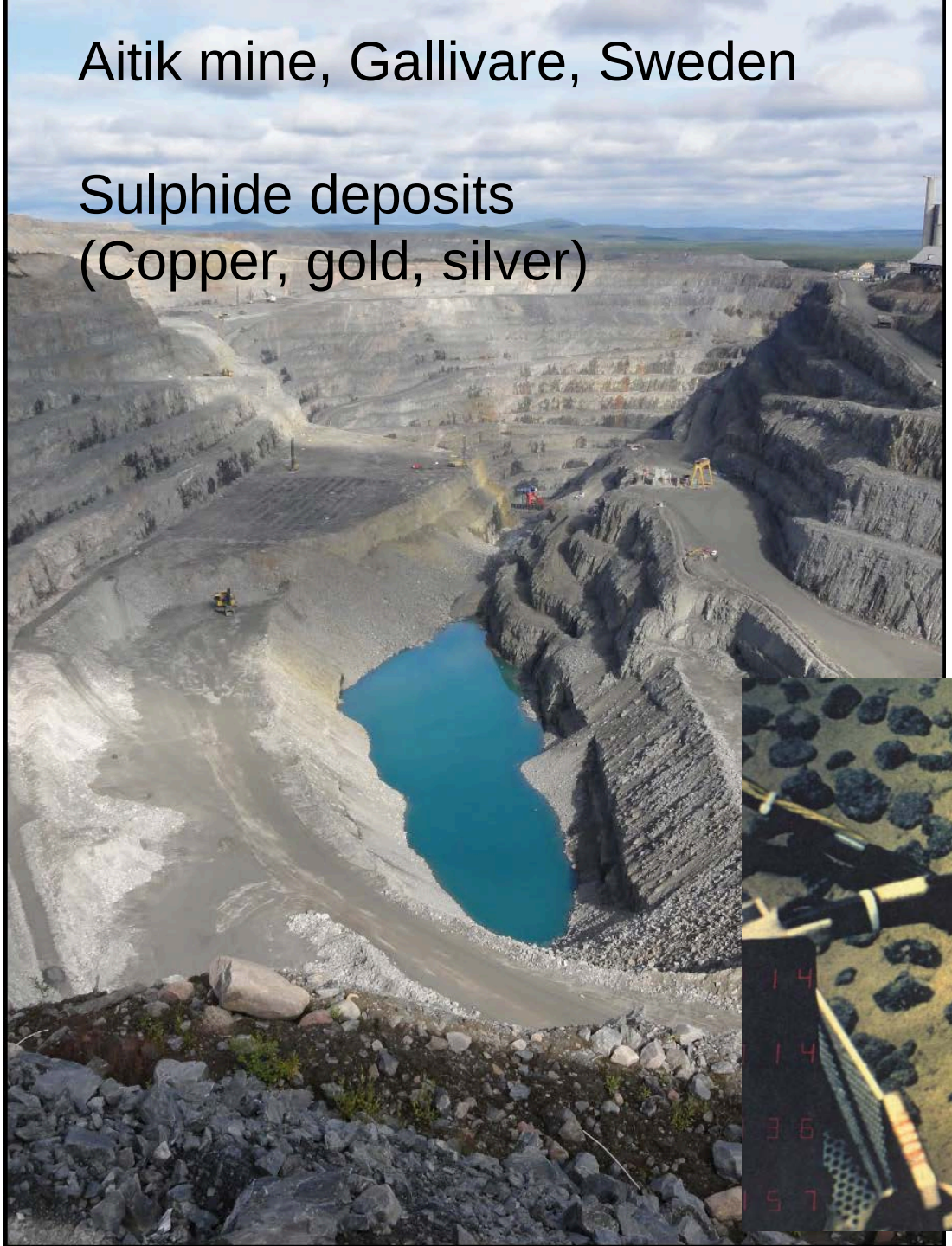
Objectives of REMPs

- to provide the relevant organs of the ISA, as well as contractors and their sponsoring States, with proactive environmental management measures and tools, including area-based management tools, to support informed decision-making that balances resource development with the protection of marine environment at regional scale;
- to provide the ISA with a clear and consistent mechanism to identify particular areas thought to be representative of the full range of habitats, biodiversity and ecosystem structures and functions within the relevant management area and/or sites in need for protection to preserve ecological balance of the marine environment in the Area;
- to provide those areas with appropriate levels of protection;
- to help the ISA to meet internationally agreed goals and targets (e.g. Sustainable Development Goals
- and Aichi Biodiversity Targets).

From ISA REMP guidance document

How will a Regional Environmental Management Plan benefit the contractor?

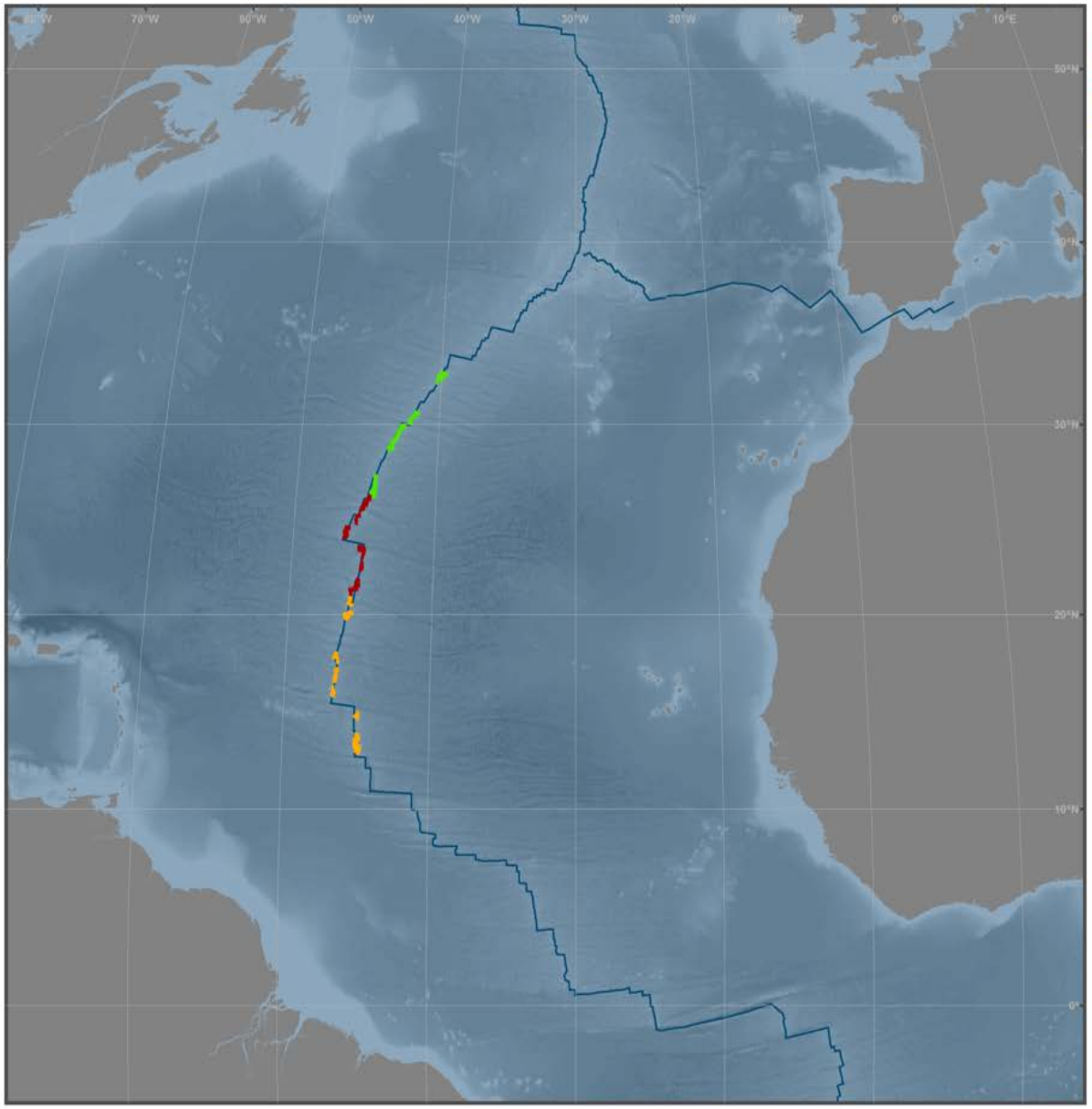
- Enables a wider perspective
- Reduces uncertainty in the planning process
- Reduces potential for conflict between different users
- Reduces environmental impacts
- Determines the scale of the precautionary approach
- Provides an understanding of each contractor's contribution to cumulative effects
- Reduces the need (and associated cost) to retrofit environmental controls at a later date
- Improves investor confidence



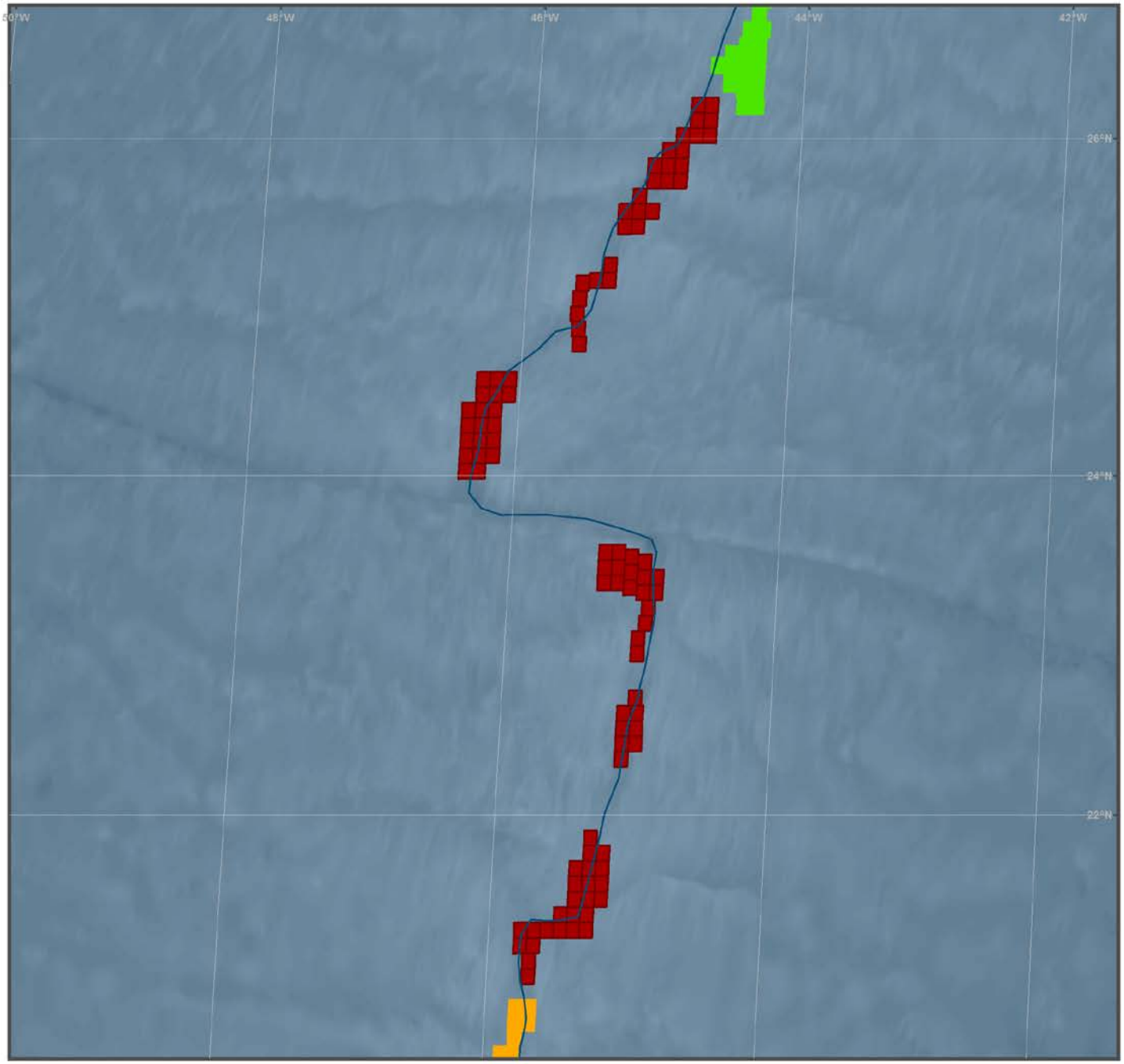
Comparison of sulphide mining with nodule mining

- Excavated area
- Composition and effect of plume

ISA Exploration Contract Areas



IFREMER (FR) Exploration Contract Areas



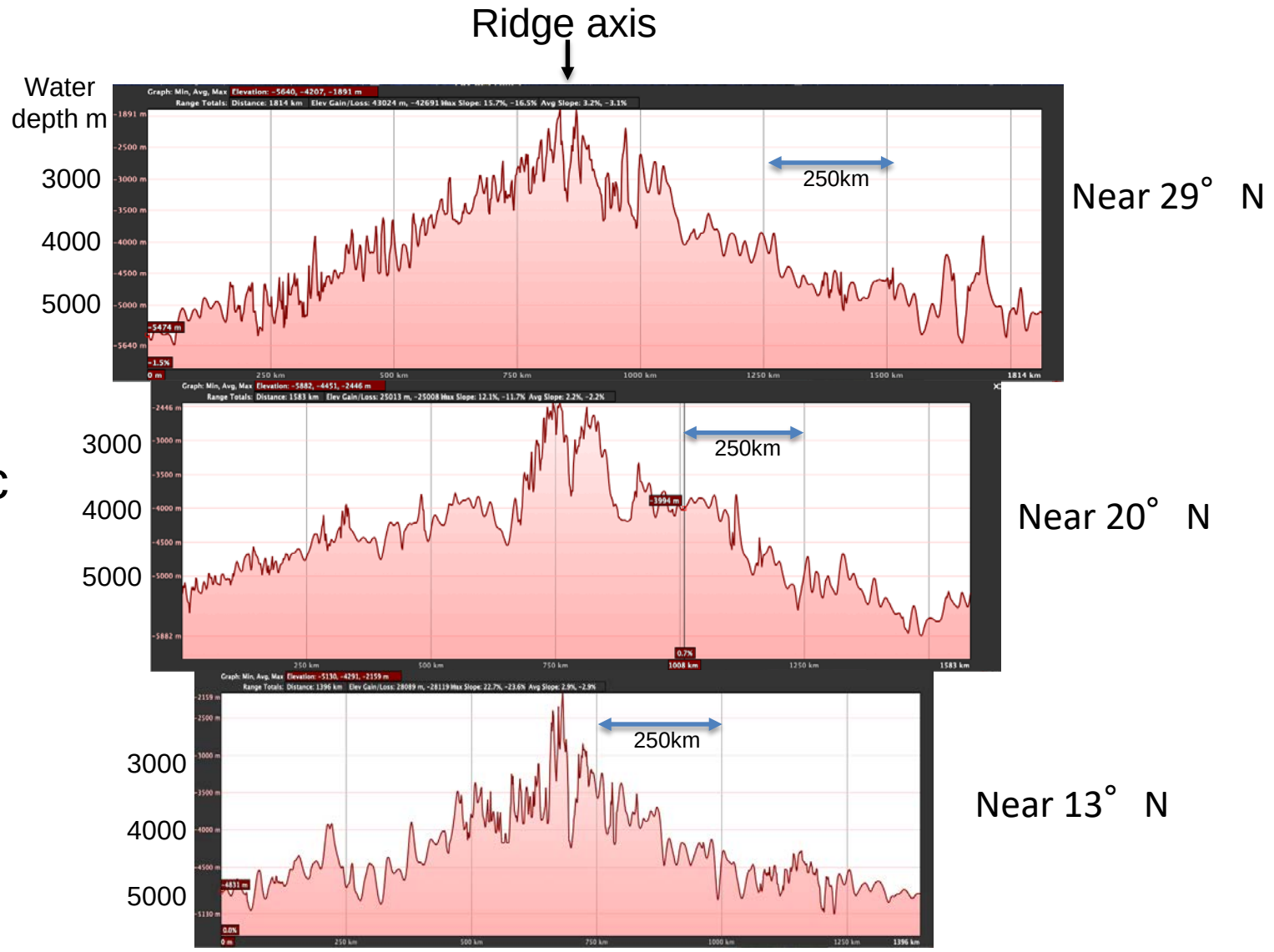
ISA Exploration Areas

- Republic of Poland
- IFREMER (France)
- Russian Federation

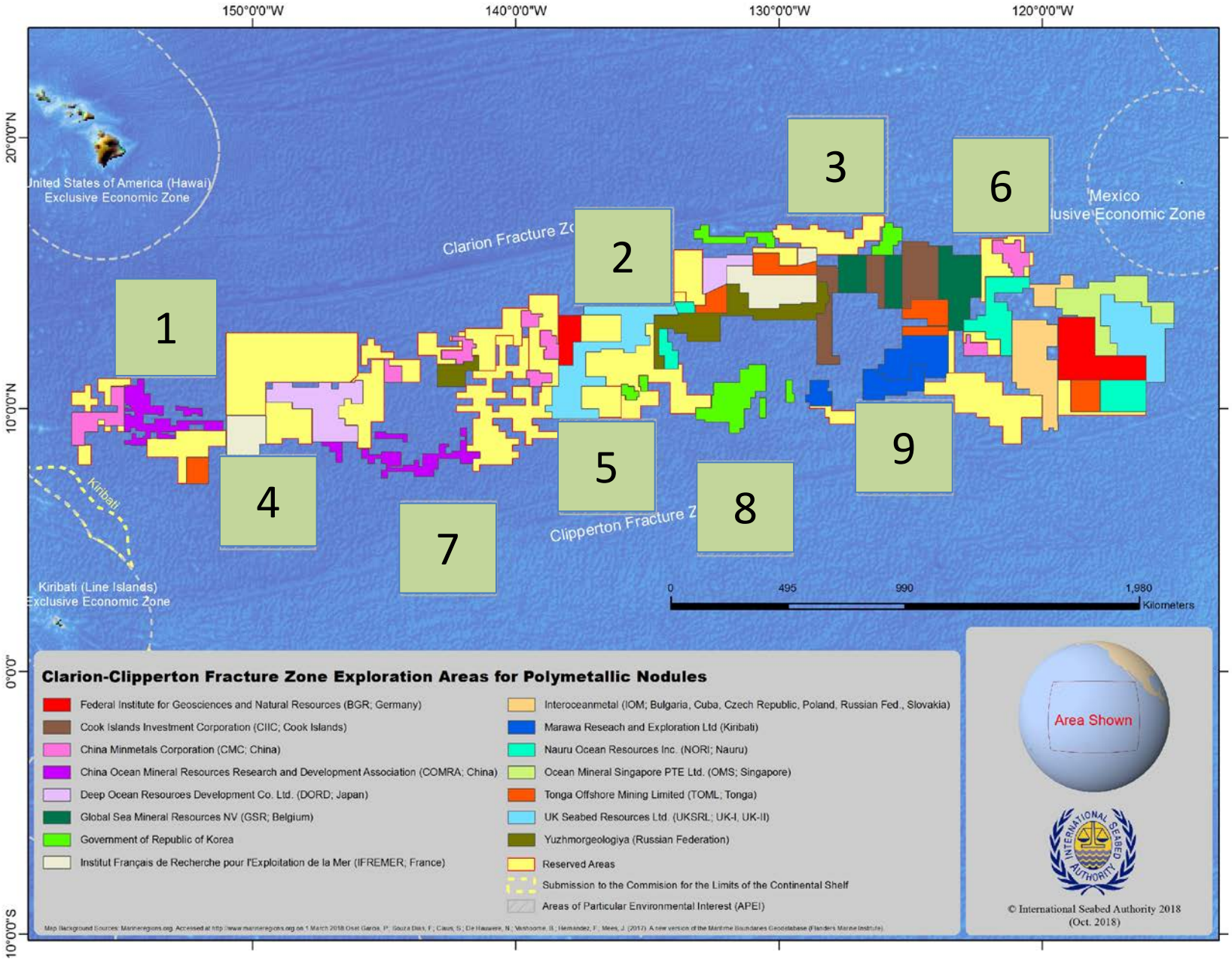
100 km

Marine Geospatial Ecology Lab, Duke University (2019)

Profiles across the Mid-Atlantic Ridge axis



Rocky outcrop is limited to a few tens of km either side of ridge axis.
Rest of seabed is predominantly sediment covered.


150°0'0"W
140°0'0"W
130°0'0"W
120°0'0"W
20°0'0"N
10°0'0"N
0°0'0"
10°0'0"S
United States of America (Hawaii) Exclusive Economic Zone
Mexico Exclusive Economic Zone
Clarion Fracture Zone
Clipperton Fracture Zone
Kiribati
Kiribati (Line Islands) Exclusive Economic Zone
1
2
3
4
5
6
7
8
9
0
495
990
1,980
Kilometers
Clarion-Clipperton Fracture Zone Exploration Areas for Polymetallic Nodules
Federal Institute for Geosciences and Natural Resources (BGR; Germany)
Cook Islands Investment Corporation (CIIC; Cook Islands)
China Minmetals Corporation (CMC; China)
China Ocean Mineral Resources Research and Development Association (COMRA; China)
Deep Ocean Resources Development Co. Ltd. (DORD; Japan)
Global Sea Mineral Resources NV (GSR; Belgium)
Government of Republic of Korea
Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER; France)
Interoceanmetal (IOM; Bulgaria, Cuba, Czech Republic, Poland, Russian Fed., Slovakia)
Marawa Reseach and Exploration Ltd (Kiribati)
Nauru Ocean Resources Inc. (NORI; Nauru)
Ocean Mineral Singapore PTE Ltd. (OMS; Singapore)
Tonga Offshore Mining Limited (TOML; Tonga)
UK Seabed Resources Ltd. (UKSRL; UK-I, UK-II)
Yuzhmorgeologiya (Russian Federation)
Reserved Areas
Submission to the Commision for the Limits of the Continental Shelf
Areas of Particular Environmental Interest (APEI)
Area Shown
INTERNATIONAL SEABED AUTHORITY
© International Seabed Authority 2018
(Oct. 2018)

Uniqueness of the ridge axis

- Exploration is currently concentrated within a few kilometres of the ridge axis
- Active hydrothermal vents are also limited to within a few kilometres of the ridge axis
- This area also provides both rocky and sedimented substrates
- Rocky substrate is not common in the Atlantic and may only form 5% of the ridge axis (50-100 km each side of the ridge)
- Rocky substrate faunas include structural species such as corals and sponges
- Sediment becomes the dominant seabed type a few kilometres away from the ridge axis and covers most of the North Atlantic ocean floor

What might mining look like in the North Atlantic?
(introduction to scenario planning)

seascape
consultants ltd

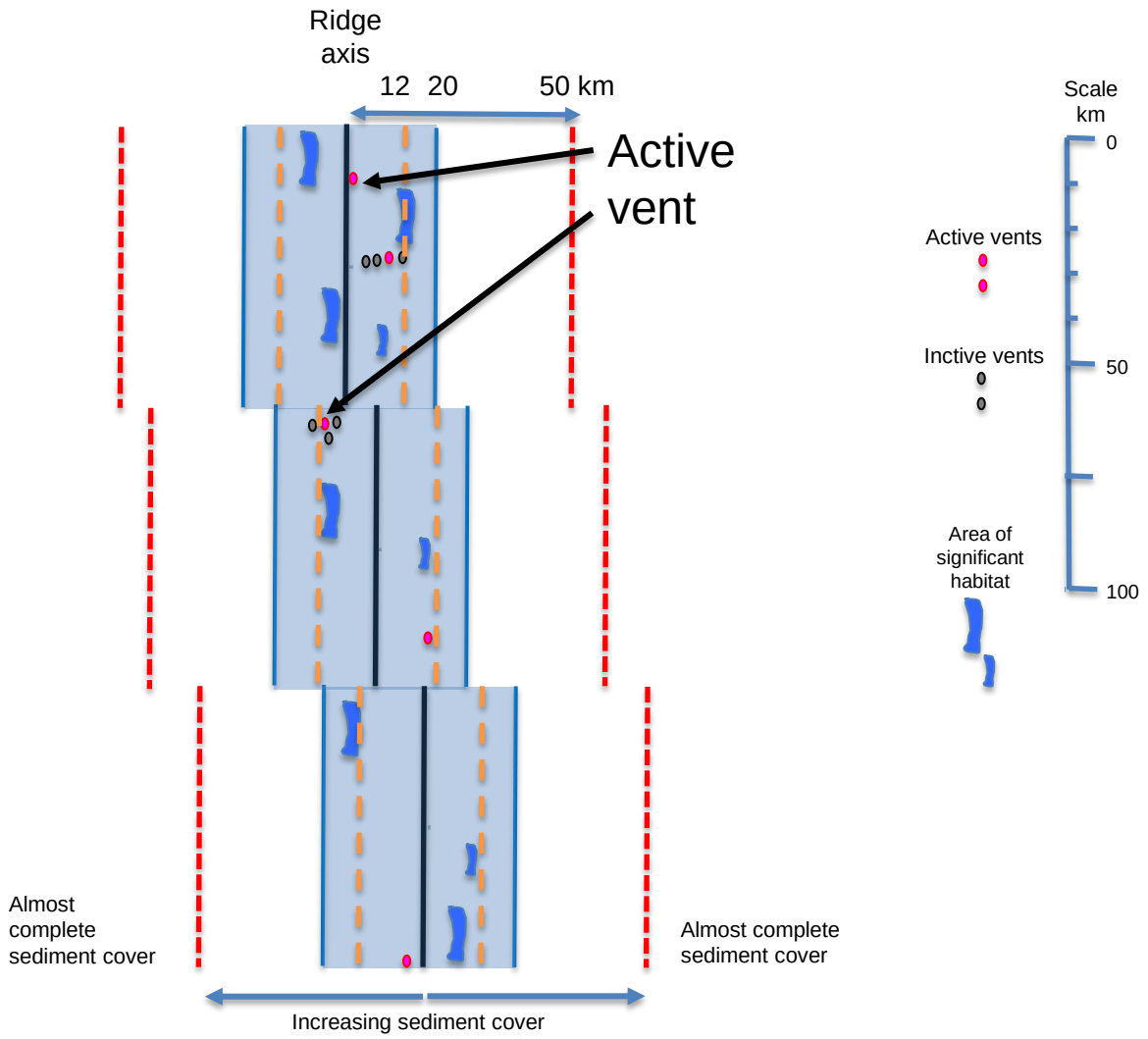
Existing information
(Plan view of mid-Atlantic ridge)

12 km max distance of most known active vents from the ridge axis.

20-30 km probable maximum distance for future exploration.

50 km probable maximum distance for exploration even with new technology.

Likely area where mining will be concentrated



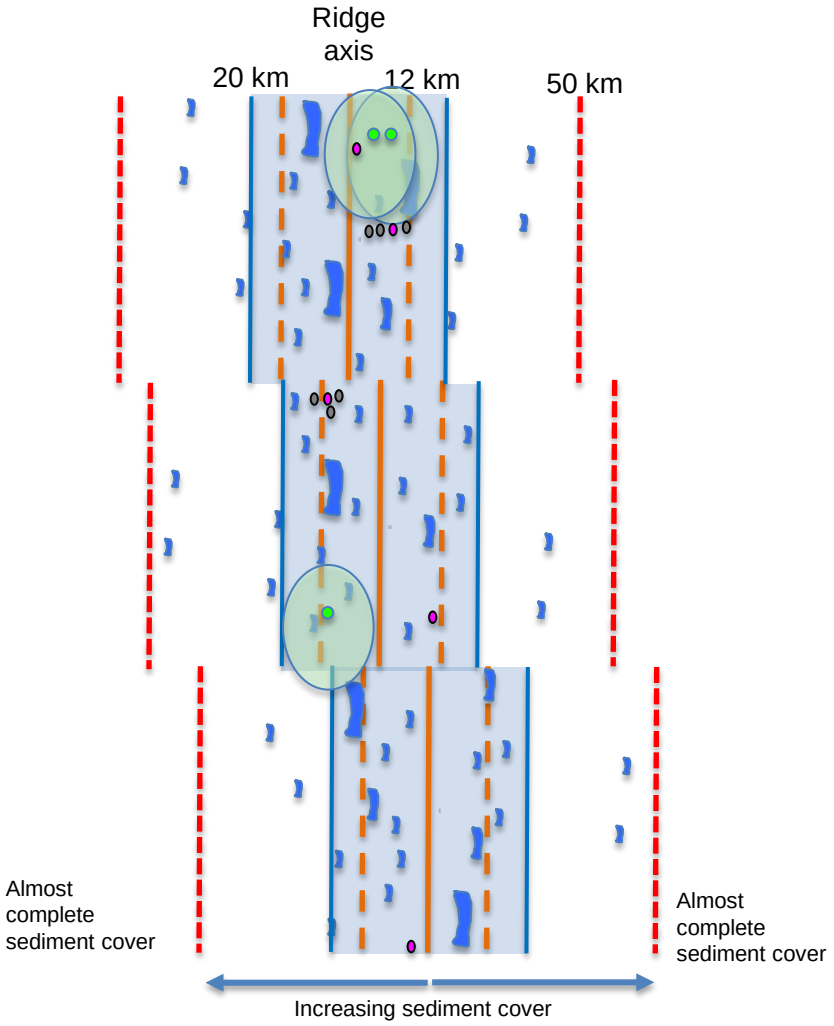
seascape consultants ltd

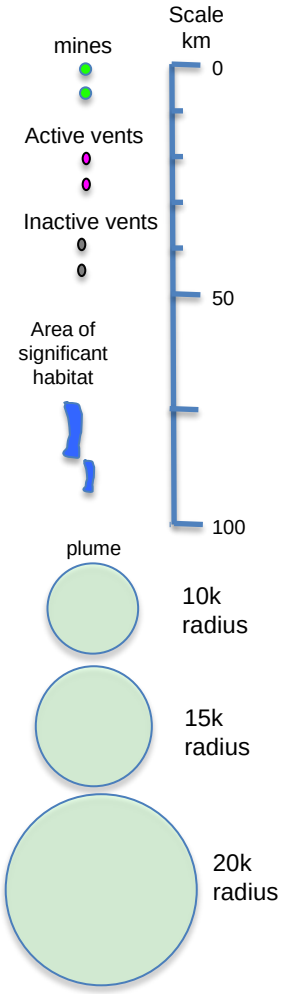
Possible mining scenario based on exploitation of large ore bodies

Significant habitat could be rocky substrate habitat such as sponges, corals etc. or other habitat that may need consideration for some protection.

Mine size scaled with ~10km radius plume impact area.

Likely area where mining will be concentrated



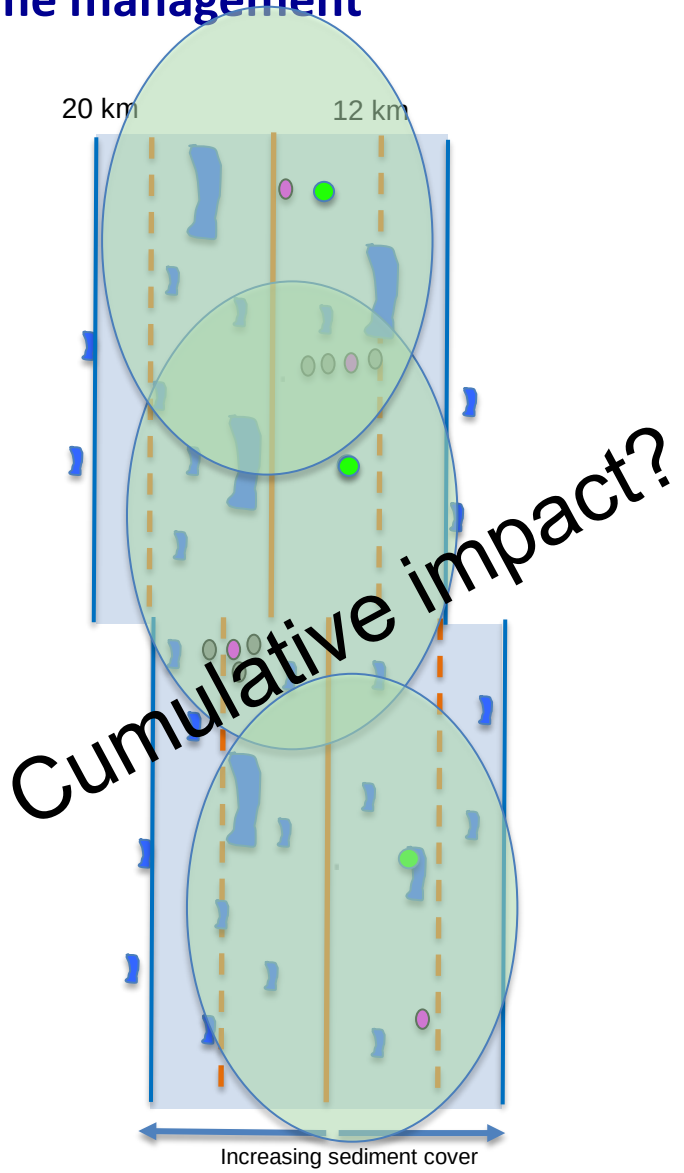


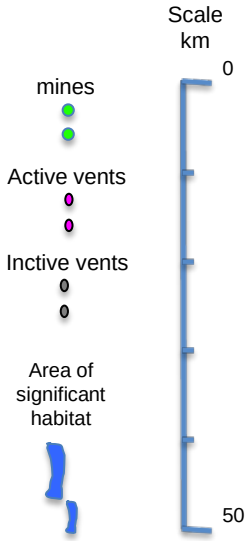
seascape consultants ltd

Mining scenario for polymetallic sulphides

Single mine but poor plume management

A likely scenario could be a small number of mines each with a small footprint and in place for several to tens of years





Likely area where mining will be concentrated

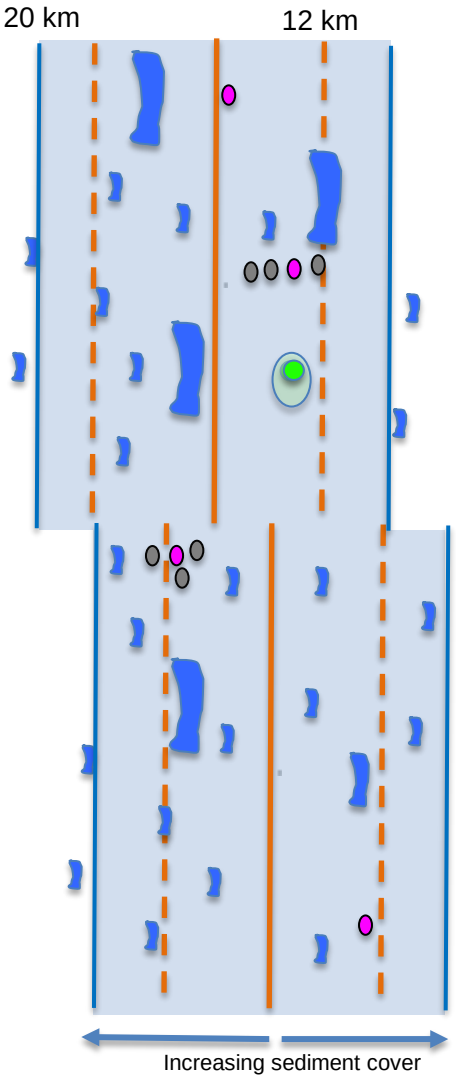
seascape consultants ltd

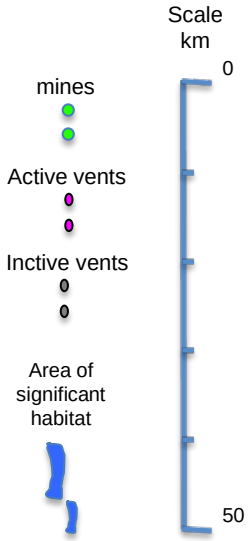
Mining scenario for polymetallic sulphides

Reduced plume spread by good engineering design

A likely scenario could be a small number of mines each with a small footprint and in place for several to tens of years

Likely area where mining will be concentrated



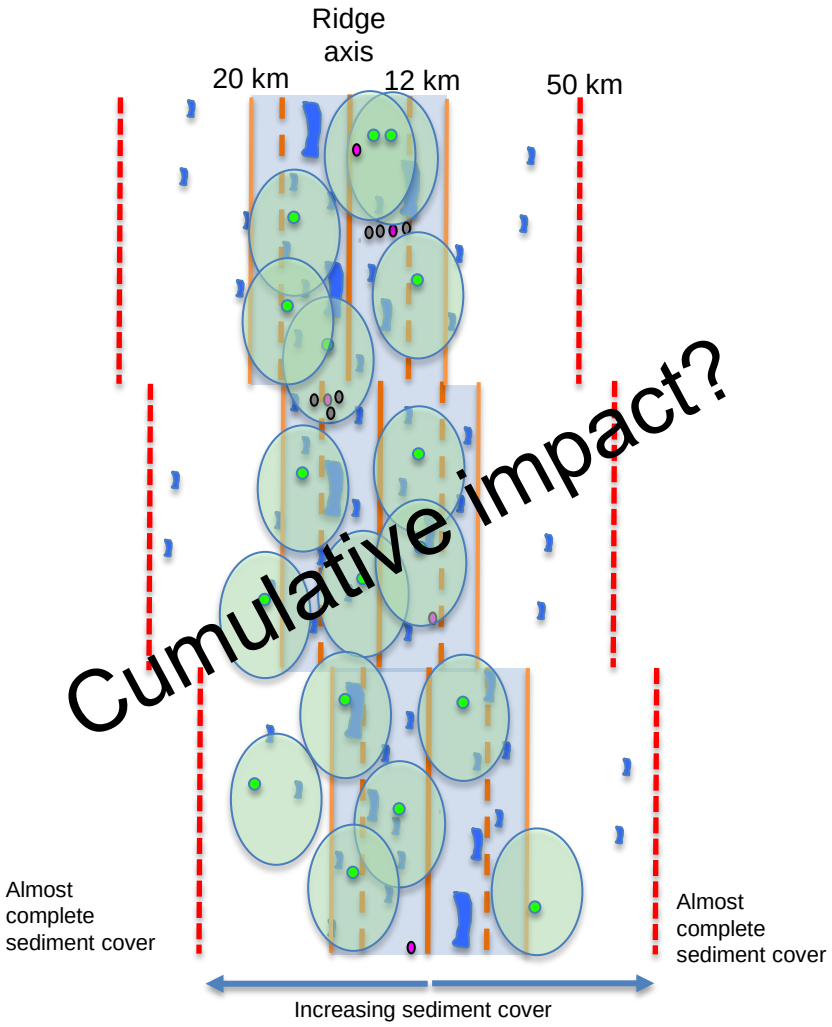


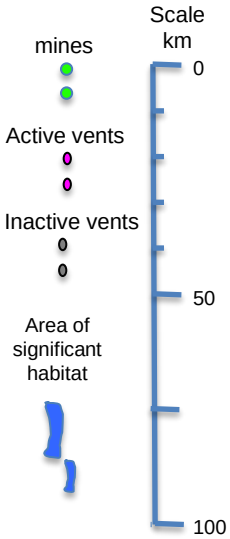
seascape consultants ltd

Possible mining scenario based on exploitation of multiple small ore bodies

Mine size scaled with 10km radius plume impact area.

Likely area where mining will be concentrated

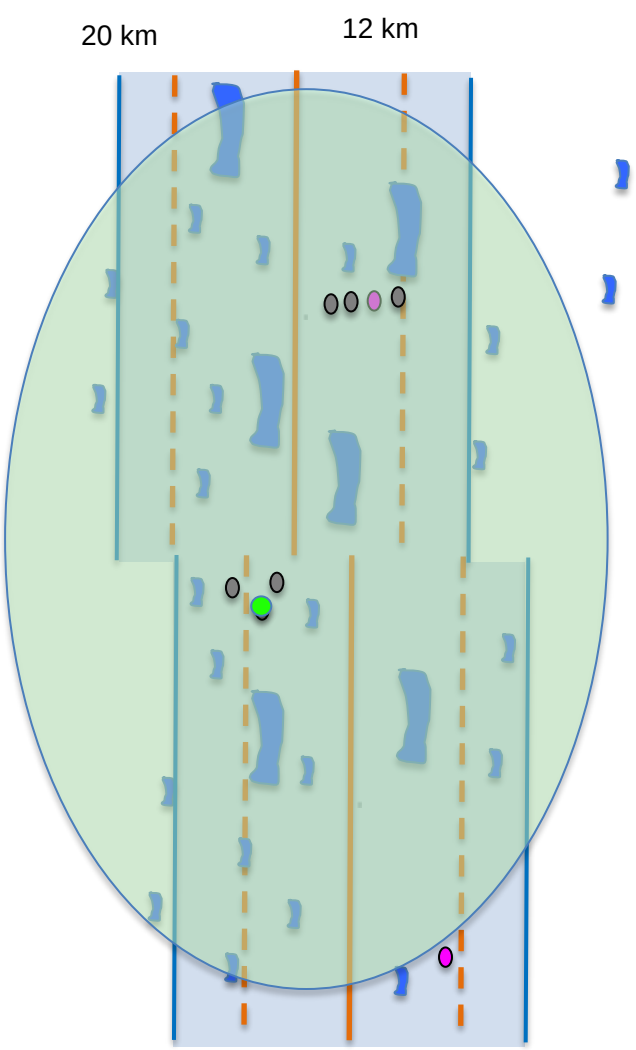


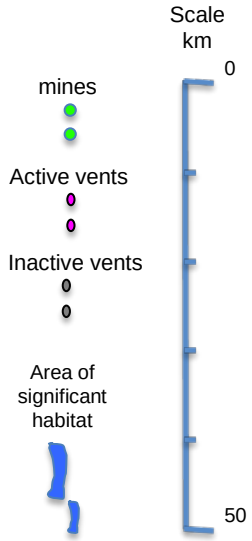


seascape consultants ltd

Water column impacts from mining scenario

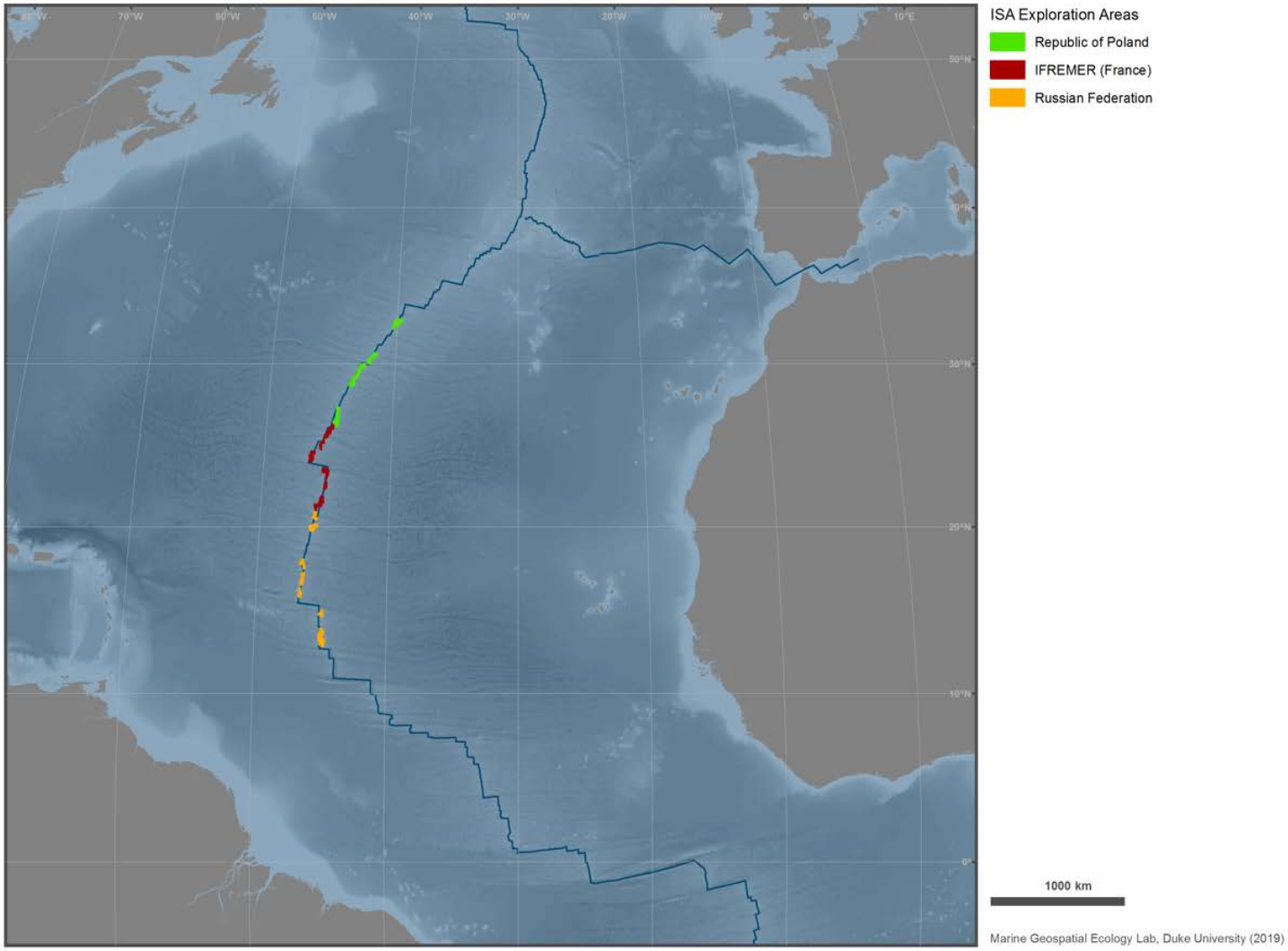
Returned water plumes could cause impacts to surface water, mid-water and near seabed organisms





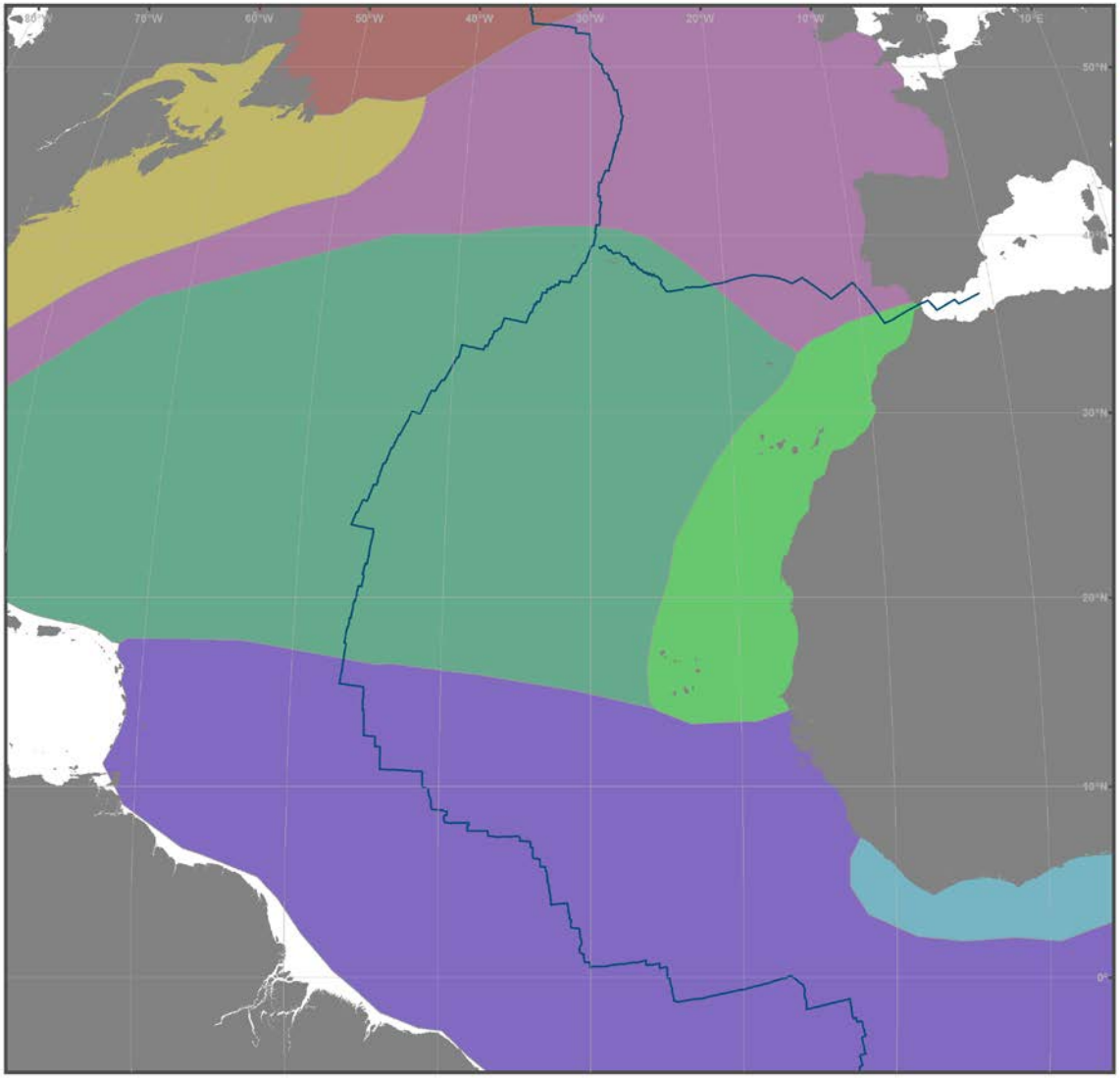
Defining the area to be covered by the Workshop

ISA Exploration Contract Areas



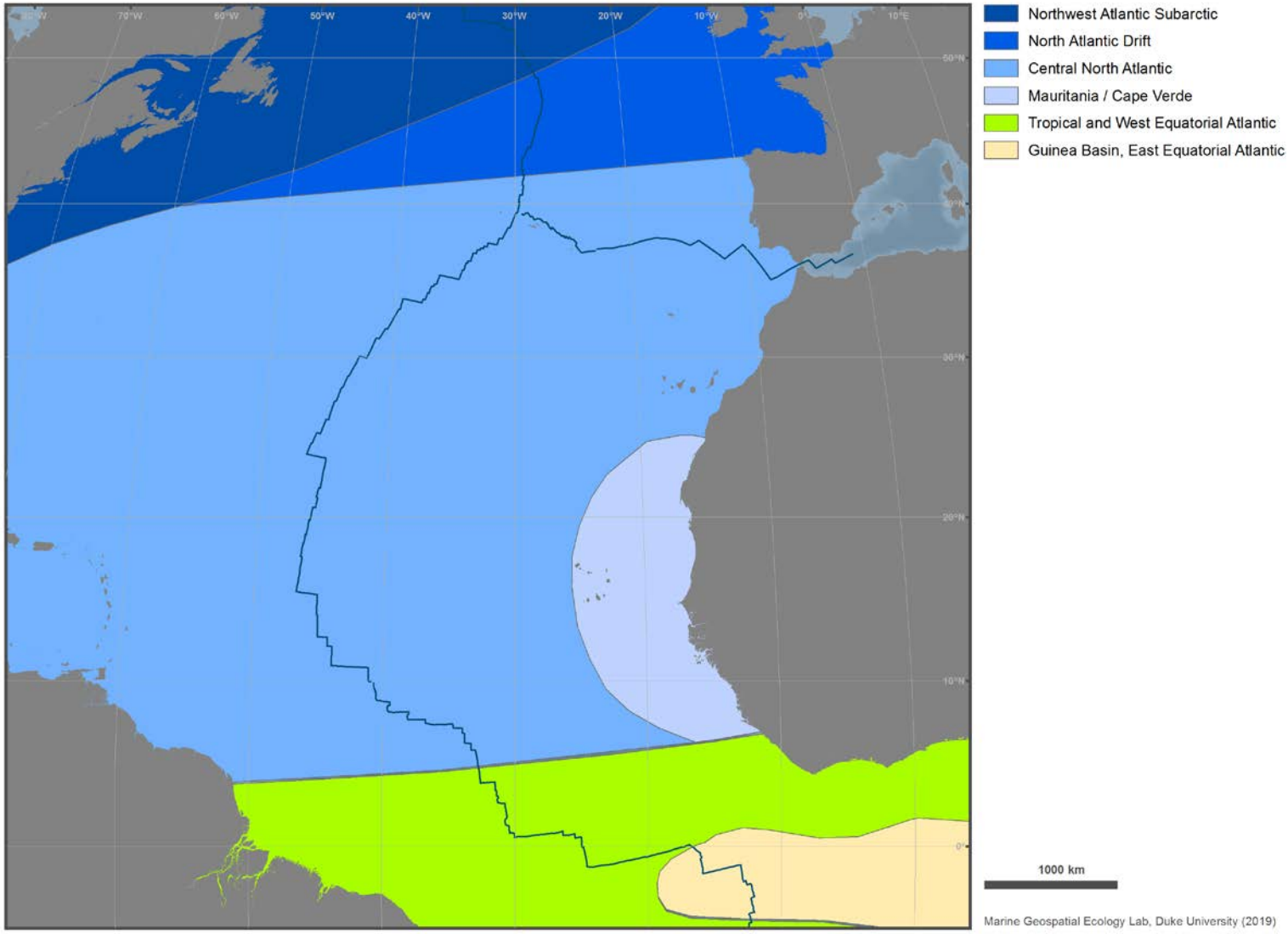
REMP guidance document: "*define the planning area, drawing on information on mineral provinces and biogeography*"

GOODS Pelagic Provinces (GOODS 2009)



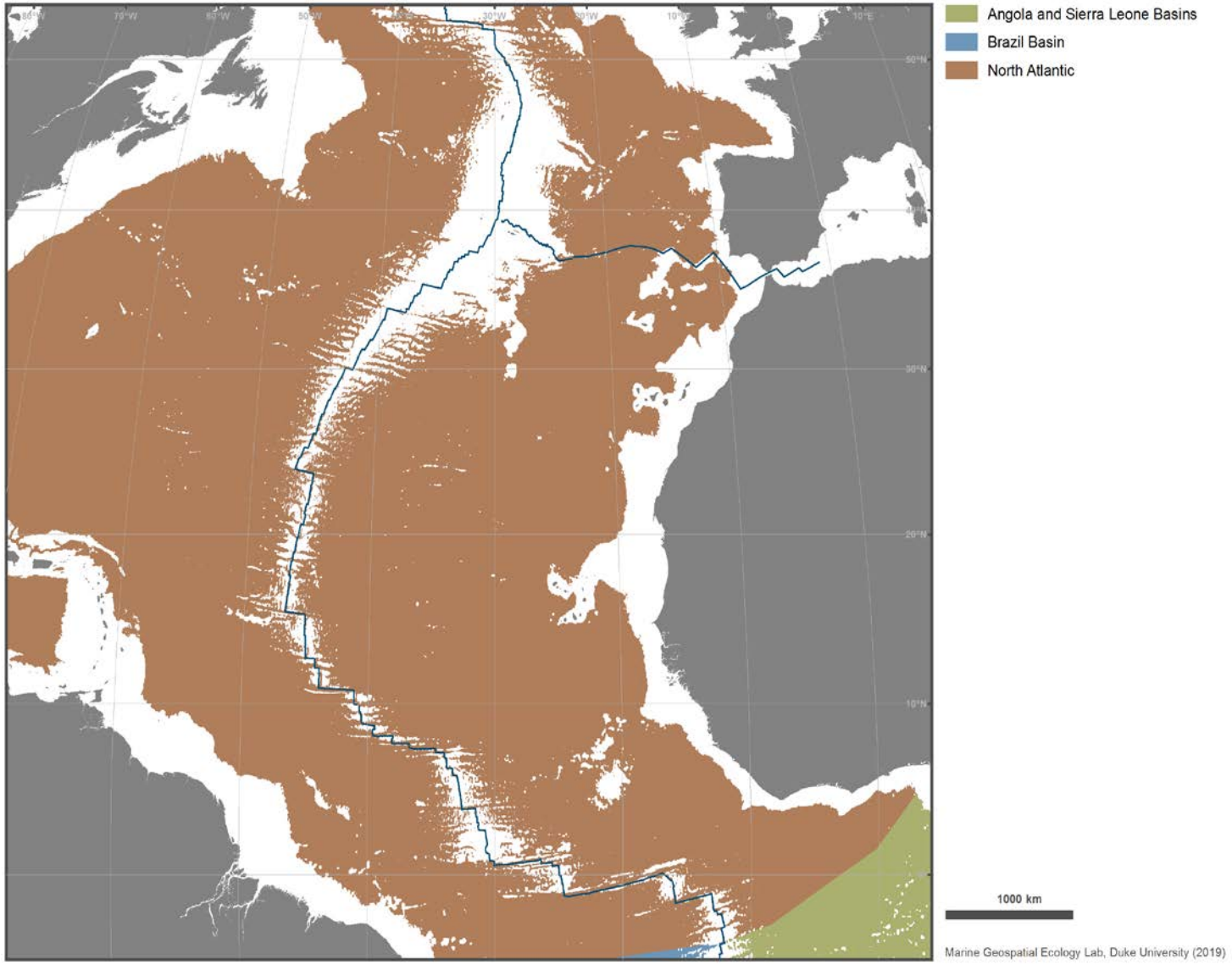
200-1000 metres waterdepth

Global Mesopelagic Provinces (Sutton et al. 2017)



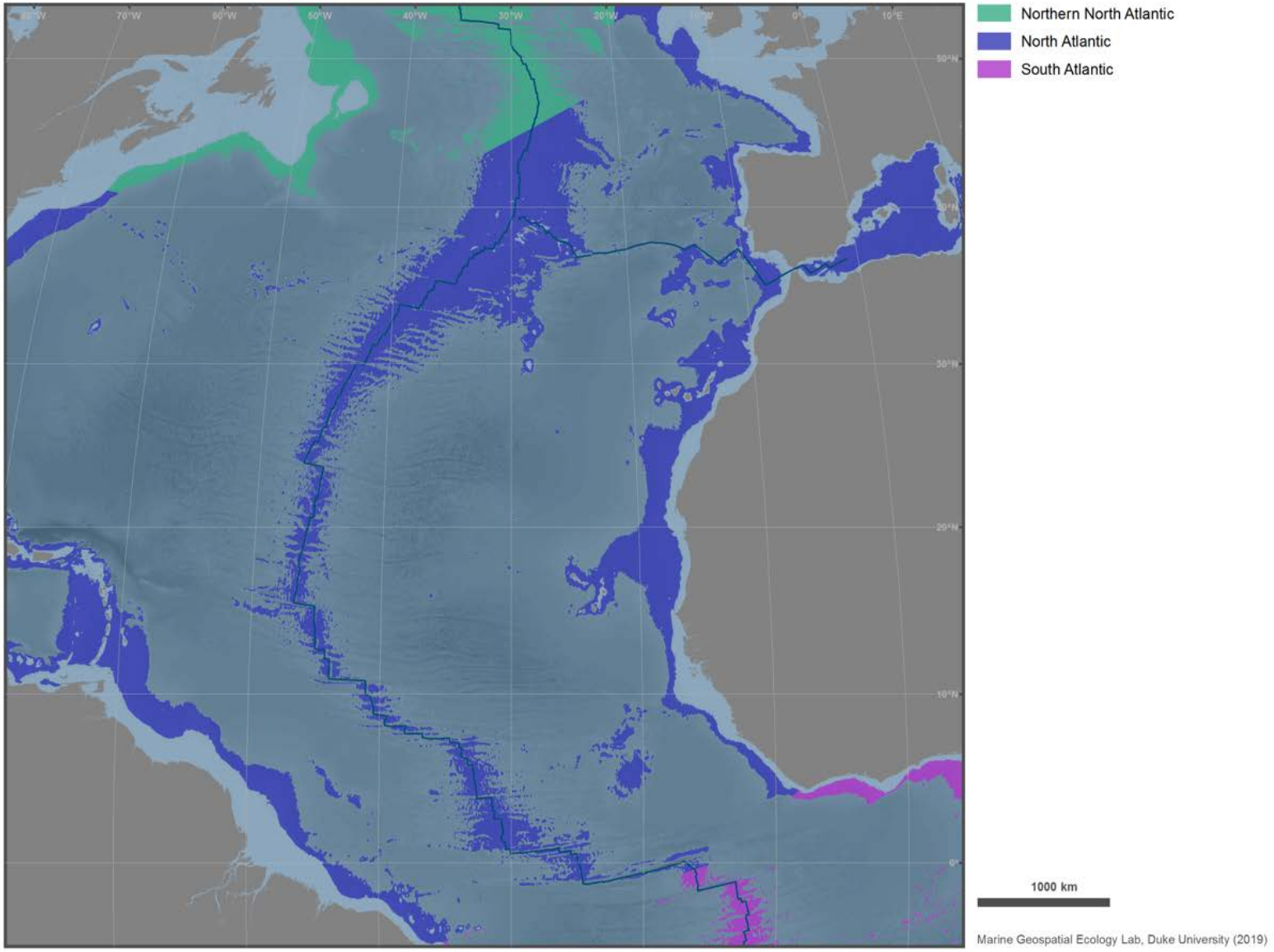
3500-6500 metres waterdepth

GOODS Abyssal Provinces (GOODS 2009)

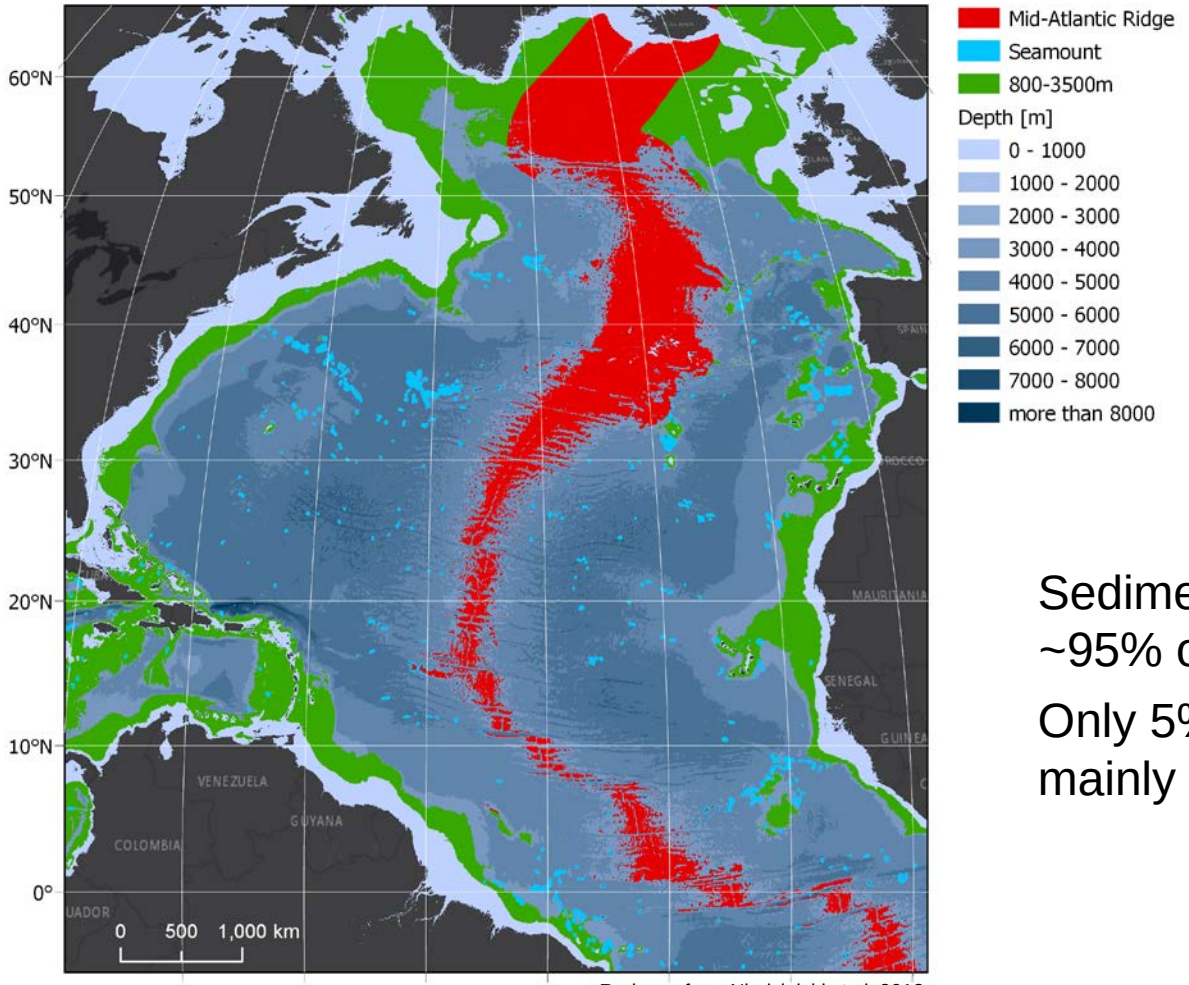


800-3000 metres waterdepth

GOODS Bathyal Provinces (GOODS 2009)



Extended Mid Atlantic Ridge Lower Bathyal Province



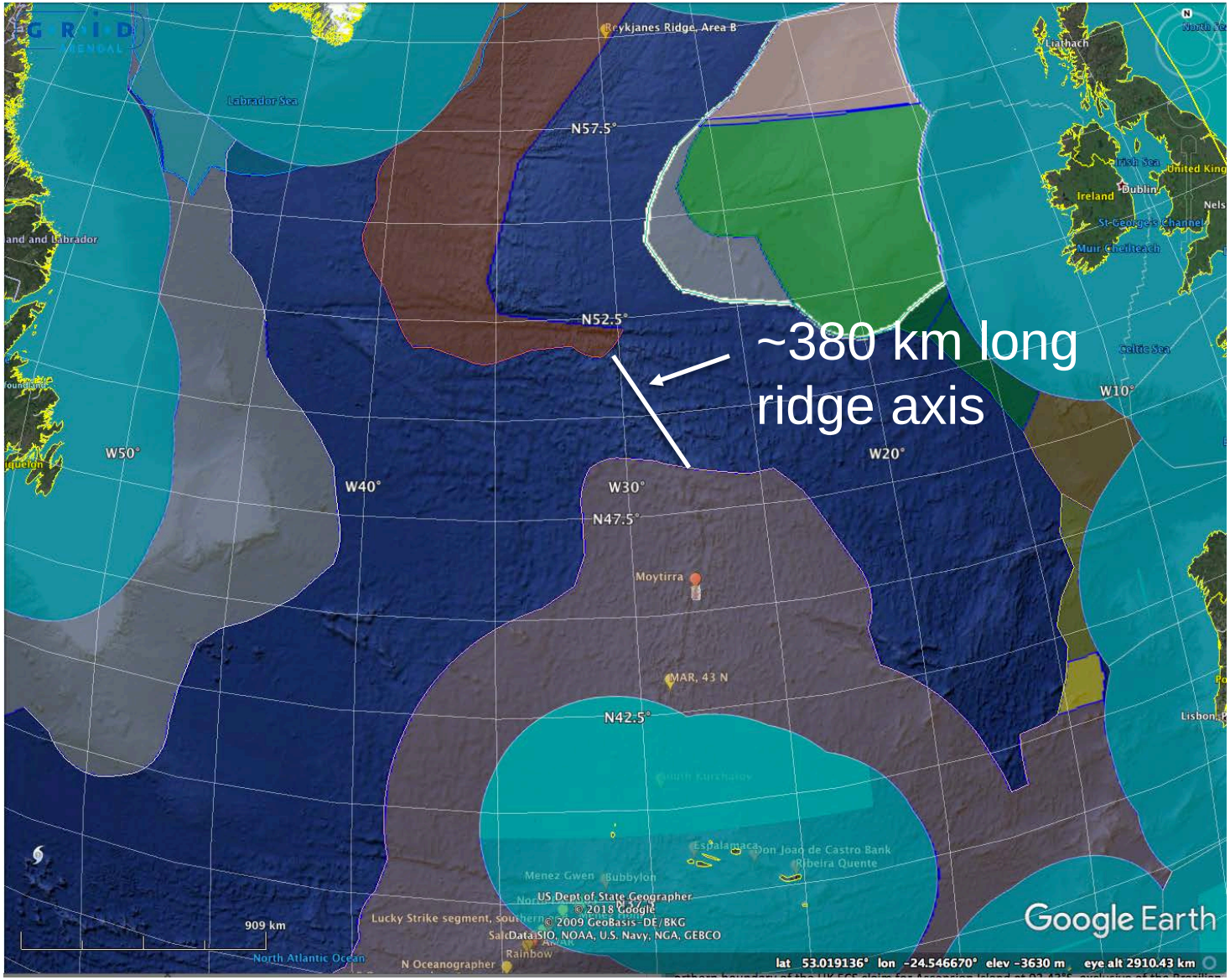
Redrawn from Niedzielski et al. 2013

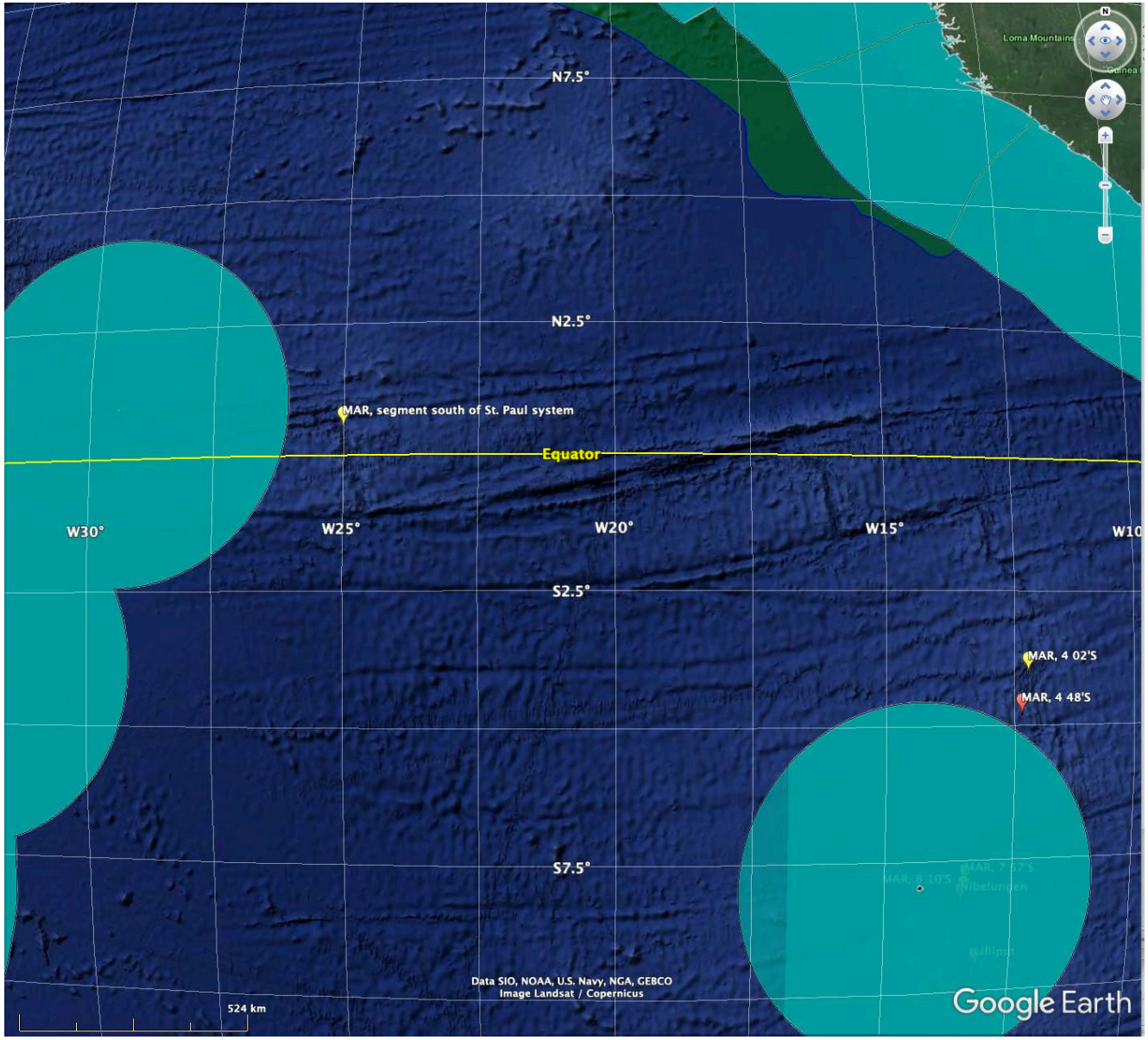
Water depth 800–3500m extending up to 400km either side of the ridge axis

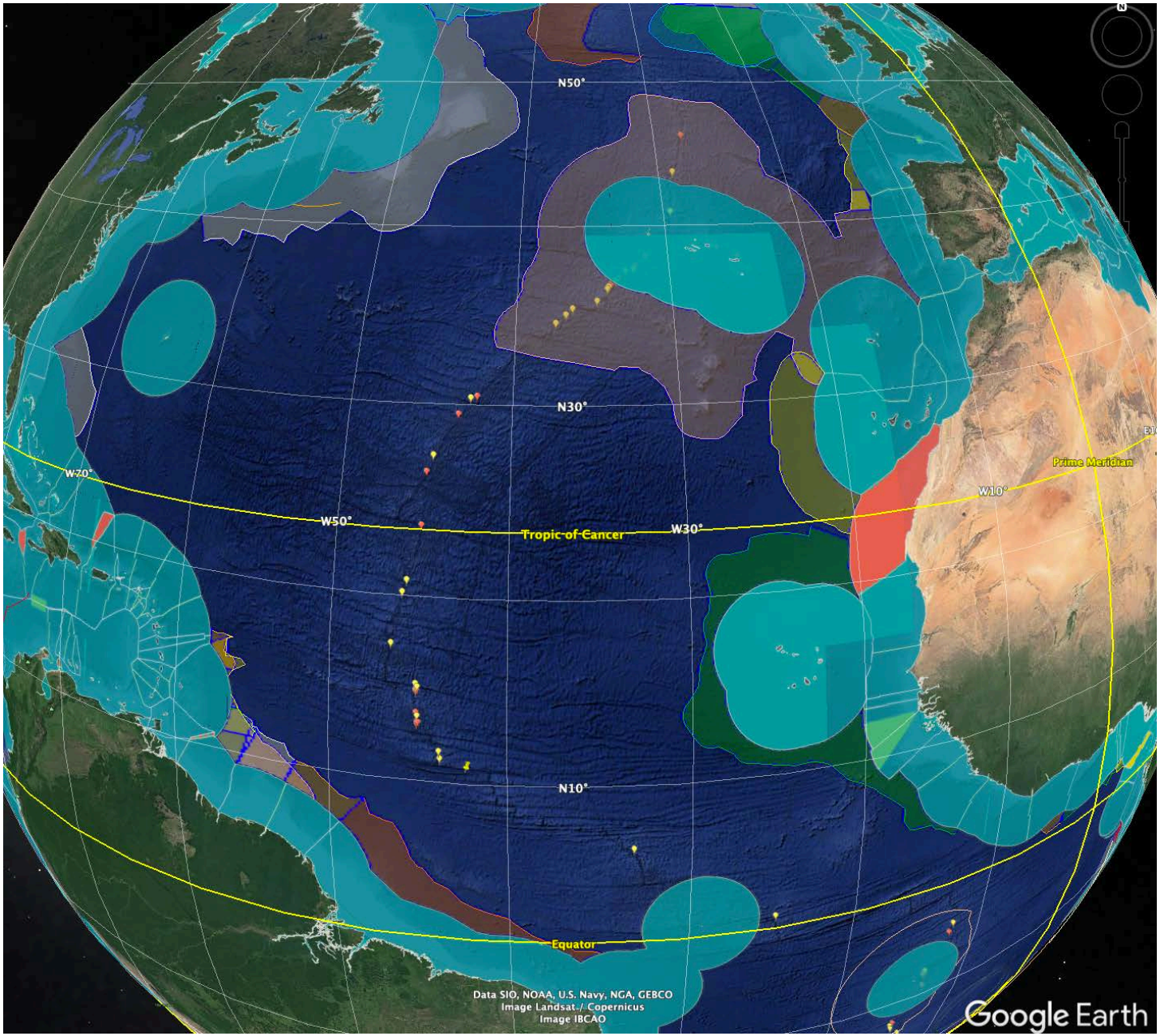
Sedimented areas cover ~95% of the red area

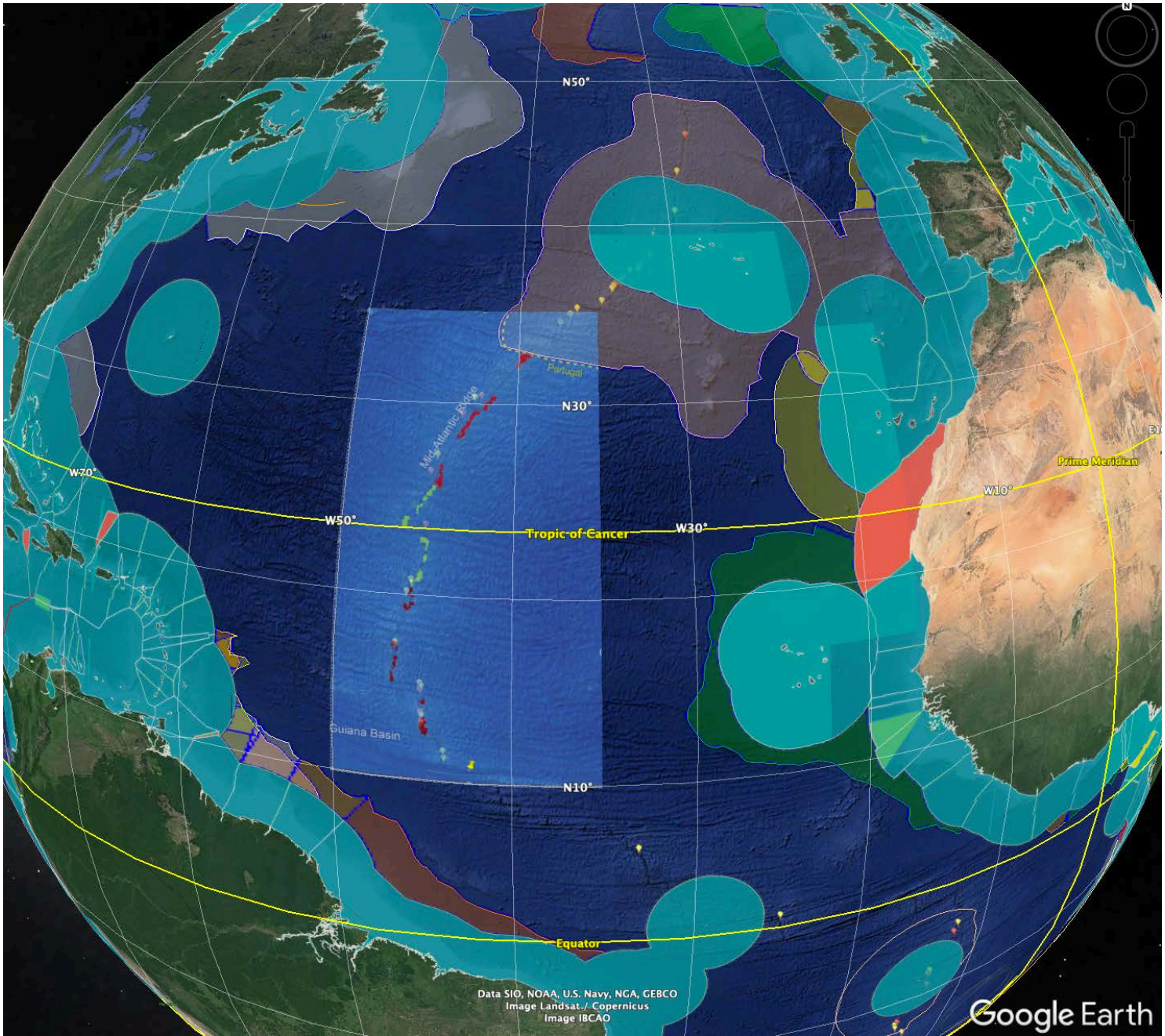
Only 5% has rock outcrops – mainly along the ridge axis

seascape consultants ltd


~380 km long
ridge axis
Reykjanes Ridge, Area B
Labrador Sea
N57.5°
N52.5°
N47.5°
N42.5°
W50°
W40°
W30°
W20°
W10°
Moytirra
MAR, 43 N
Ireland
Dublin
Irish Sea
Celtic Sea
St George's Channel
Muir Gheilteach
Menez Gwen
Bubbylon
Rainbow
N Oceanographer
Lucky Strike segment, southern
North Atlantic Ocean
909 km
US Dept of State Geographer
© 2018 Google
© 2009 GeoBasis-DE/BKG
Sal, Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth
lat 53.019136° lon -24.546670° elev -3630 m eye alt 2910.43 km


Loma Mountains
N7.5°
N2.5°
MAR, segment south of St. Paul system
Equator
W30°
W25°
W20°
W15°
W10
S2.5°
MAR, 4 02'S
MAR, 4 48'S
S7.5°
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
524 km
Google Earth


N50°
N30°
W70°
W50°
Tropic of Cancer
W30°
Prime Meridian
W10°
N10°
Equator
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Image IBCAO
Google Earth


N50°
N30°
N10°
W70°
W50°
W30°
W10°
Prime Meridian
Tropic of Cancer
Equator
Portugal
Mid-Atlantic Ridge
Guiana Basin
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Image IBCAO
Google Earth

Options for area to be discussed at this meeting

Latitudinally

1. All parts of the Area in the North Atlantic south of Iceland's extended continental shelf claim
2. The area of the contracts
3. All parts of the Area in the North Atlantic south of Portugal's extended continental shelf claim to the equator
4. All parts of the Area in the North Atlantic south of Portugal's extended continental shelf claim to the southern margin of the Romanche Fracture Zone

Longitudinally

1. Ridge axis to 50 km each side
2. Ridge axis to ? km