

The UU-NIOZ joint project: Protecting deep seabed hydrothermal vent fields through area- based management tools



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Active hydrothermal vents meet criteria to proceed with protection. What area would need protection?*

Sabine Gollner

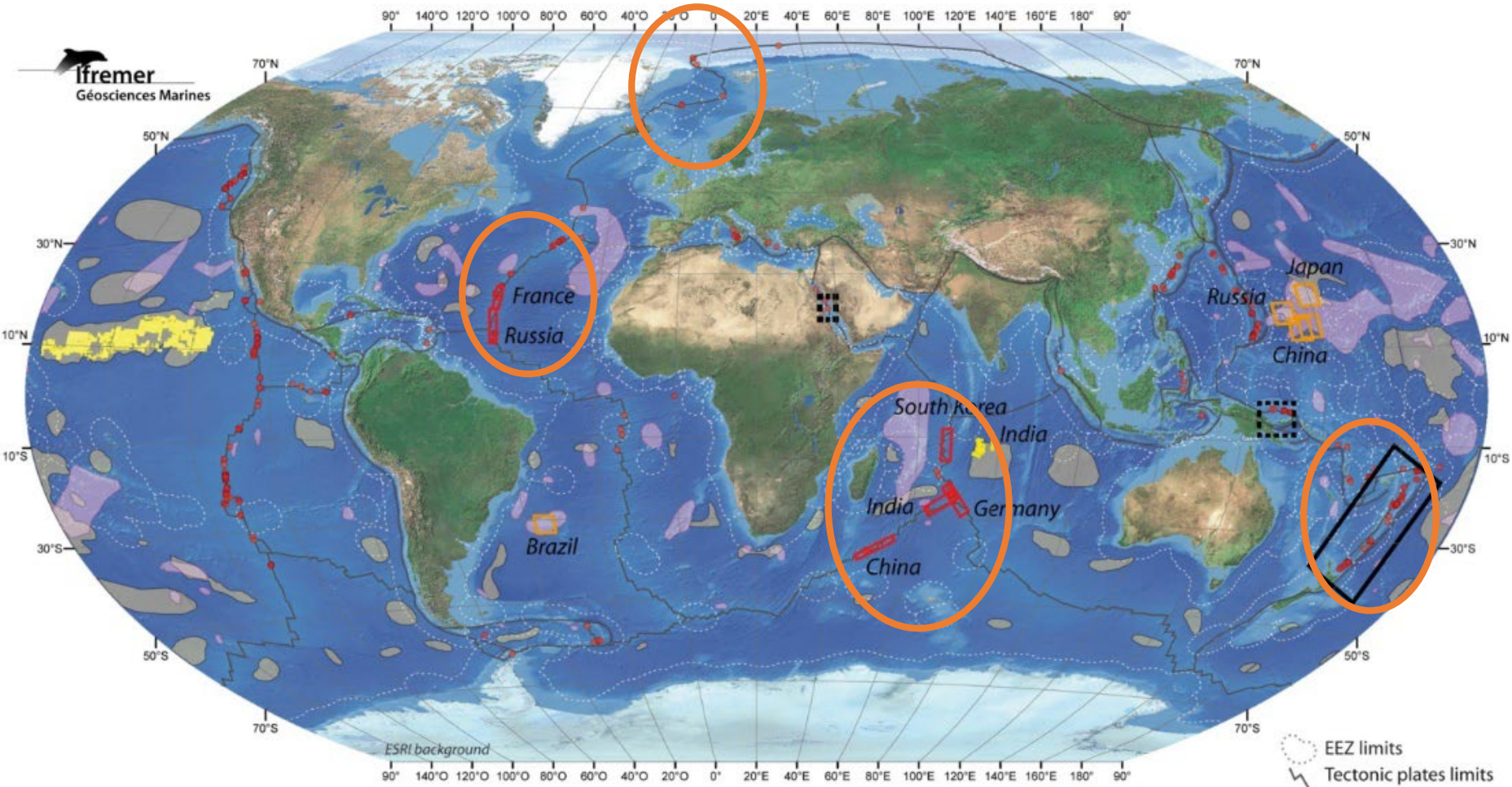
Royal Netherlands Institute for Sea Research NIOZ (Netherlands)



*presented on 10th of May 2023

Deep-sea mineral resources

polymetallic nodules/abyssal plains, **polymetallic sulfides/hydrothermal vents**, cobalt-rich crusts/seamounts



Exploration contracts in International Seas (under ISA control):

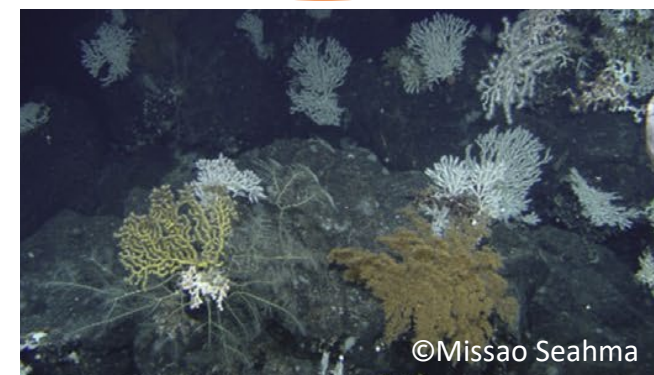
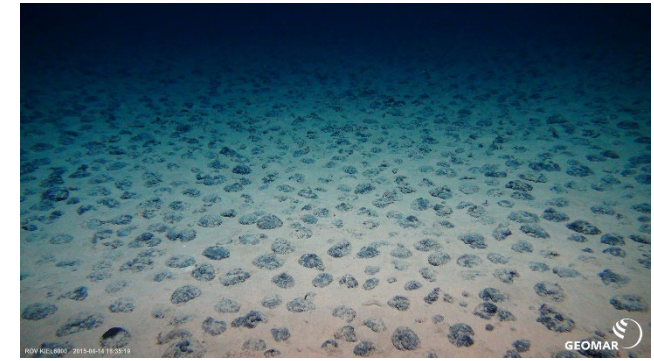
- Polymetallic nodules exploration
- Cobalt-rich ferromanganese crusts exploration
- Hydrothermal polymetallic sulfides exploration

Intra EEZ:

- Areas with polymetallic sulfides exploration licences
- Areas with polymetallic sulfides exploitation licences

- Polymetallic nodules areas
- Cobalt-rich ferromanganese crusts areas
- Hydrothermal polymetallic sulfides areas

0 5 000 Km



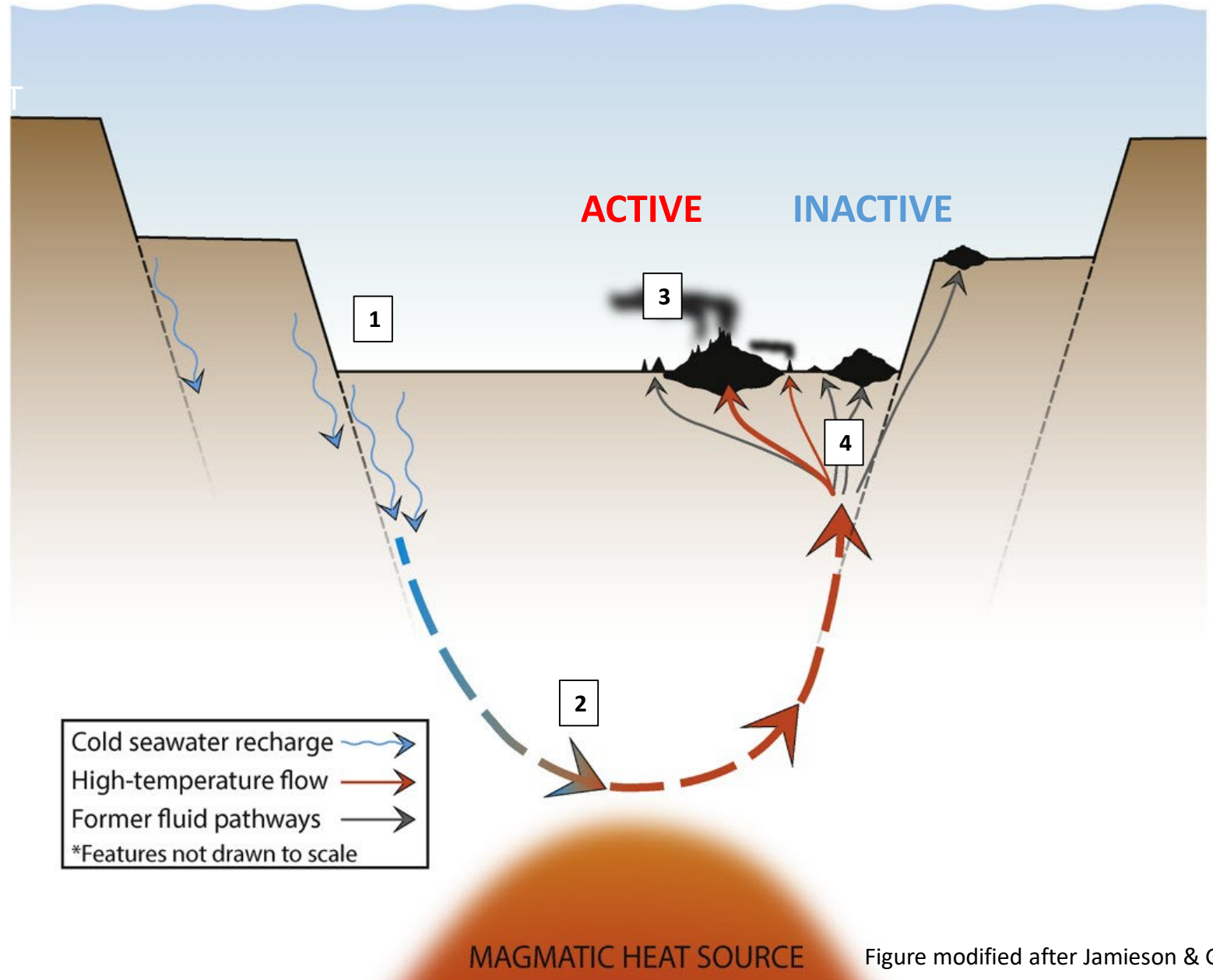
The vent ecosystem: hot fluids, enriched in sulfide and metals

The vent ecosystem:

Fluids derive from ocean water which
(1) sinks through cracks into crust
(2) gets heated by magma and enriched in metals
(3) exits through channels & precipitates the metals (= black smokers)

OR (=INACTIVE VENTS)

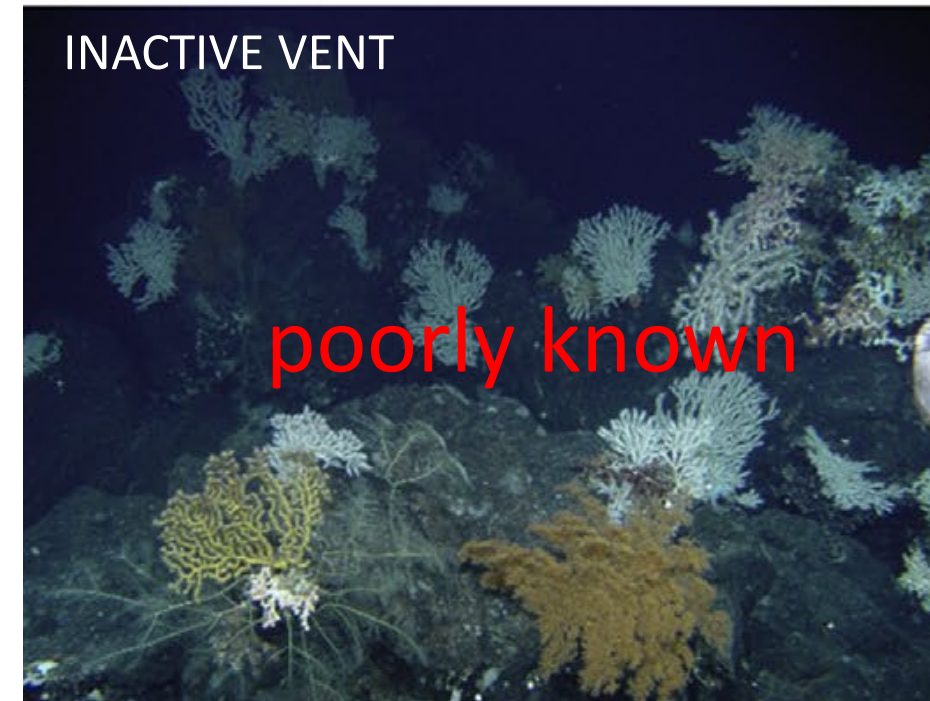
(4) Fluids can't exit anymore (channels naturally blocked thus stopping temporarily vent fluid emissions).



The vent ecosystem and its biodiversity



- spatially close
- The subseafloor, seafloor and water column are geologically and biologically connected.



Unique vent endemic species occur in high biomass:

- Microbes
- Snails
- Mussels
- Shrimp
- Tubeworms

Vulnerable species:

- Corals
- Sponges

The vent ecosystem has many unique species and many crucial ecosystem services.

But are vent fields unique and fragile?
And if yes – all of them?

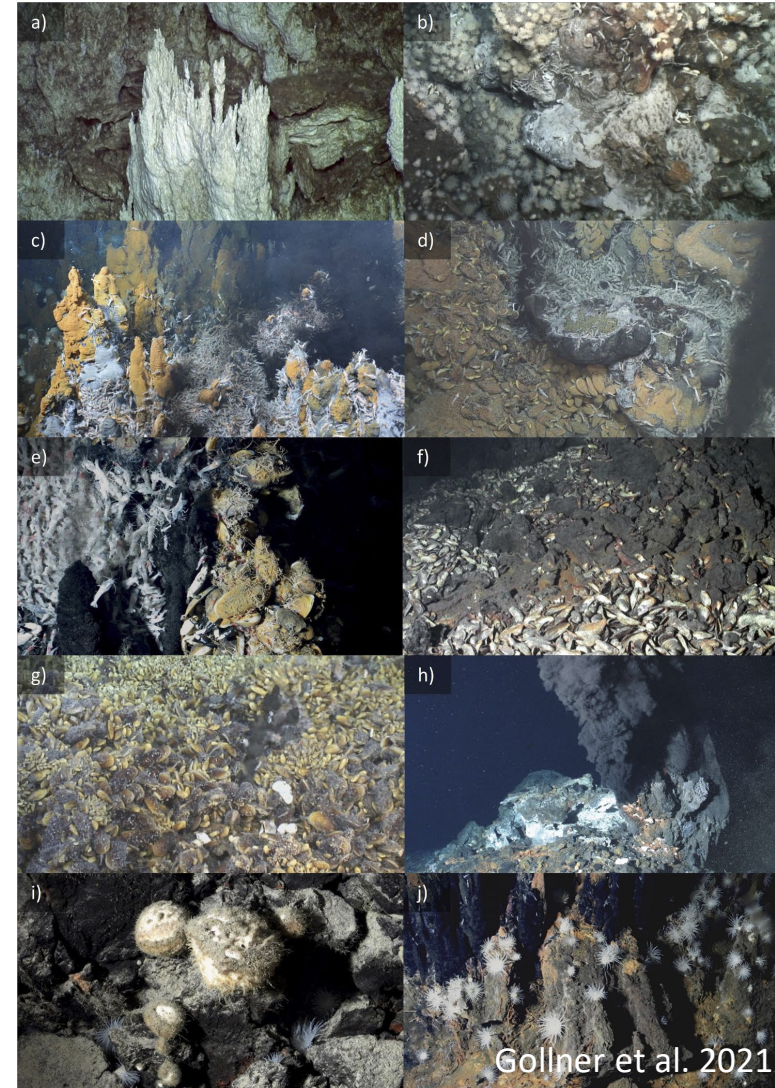
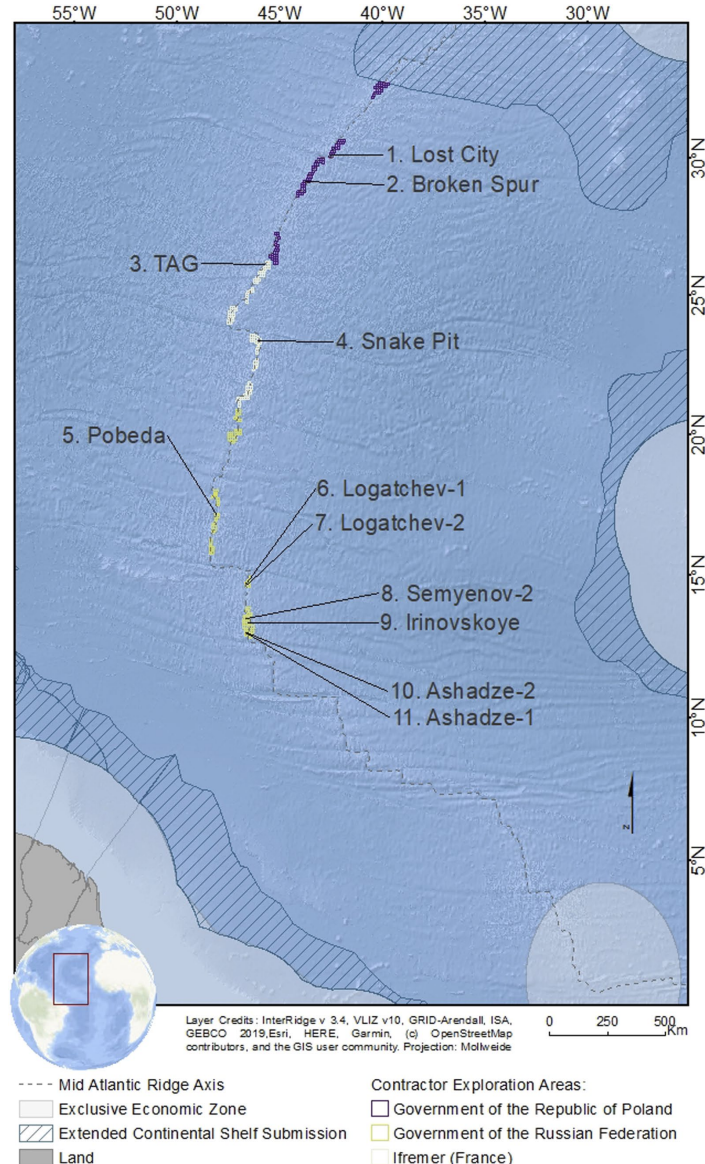
Unique vent fields along the nMAR

-> scientific review

-> based on scientific knowledge (from the past ~40 years)

Locations of the 11 hydrothermal vent fields within the Area on the nMAR and of the exploration contract blocks ($\leq 10 \text{ km} \times 10 \text{ km}$; not to scale) awarded by the International Seabed Authority to date.

From the InterRidge Global Database of Active Submarine Hydrothermal Vent Fields Version 3.4. PANGAEA.



Vent fields on the nMAR.

- a) Lost City
- b) Broken Spur
- c) TAG
- d) Snake Pit
- e) Logatchev-1
- f) Logatchev-2
- g) Semyenov-2
- h) Irinovskoye
- i) Ashadze-2
- j) Ashadze-1

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Unique vent fields in the Indian Ocean

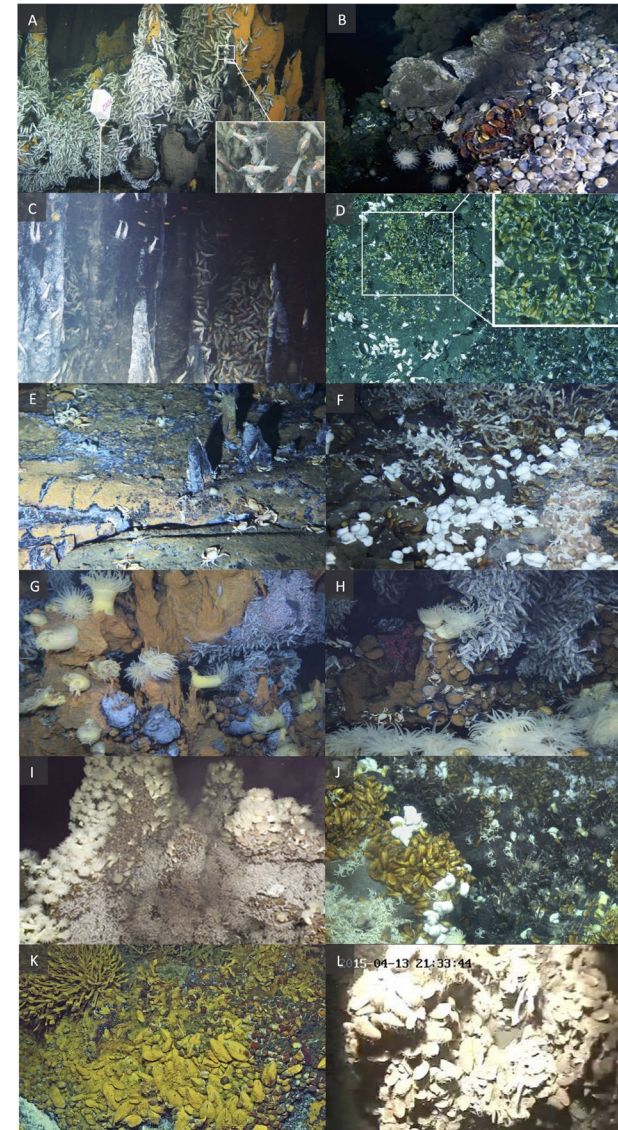
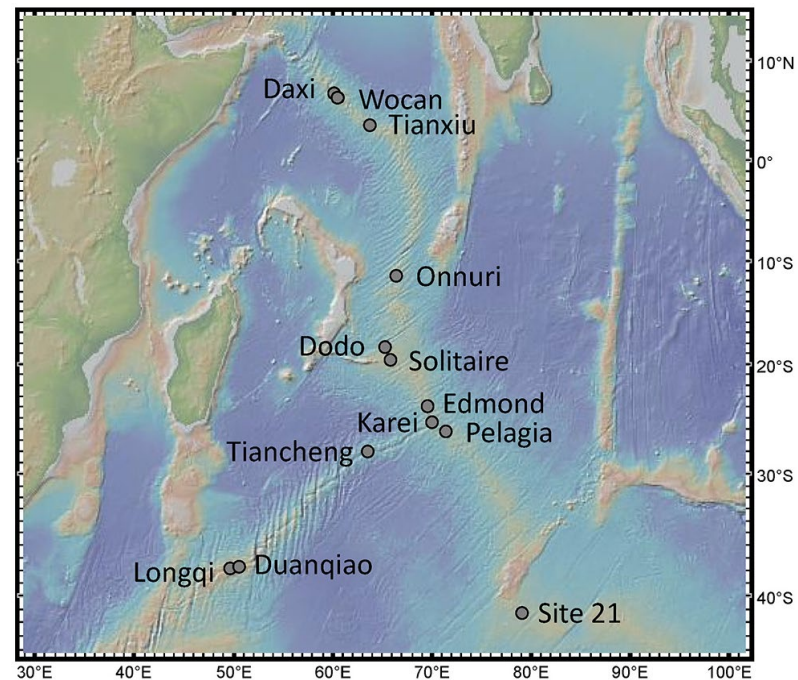
->scientific review

->based on scientific knowledge (from the past ~20 years)

Active hydrothermal vent ecosystems in the Indian Ocean are in need of protection

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and Sabine Gollner¹

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Vent fields at IOR

- (A) Daxi
- (B) Wocan
- (C) Tianxiu
- (D) Onnuri
- (E) Dodo
- (F) Solitaire
- (G) Edmond
- (H) Kairei
- (I) Pelagia
- (J) Tiancheng
- (K) Longqi
- (L) Duanqiao

What area would need protection?

From a science perspective we know enough to proceed with the protection of the vent ecosystem.

Current protection in ABNJ includes a point-coordinate for active vents (SINP) and a zoning scheme for protection (not further defined).

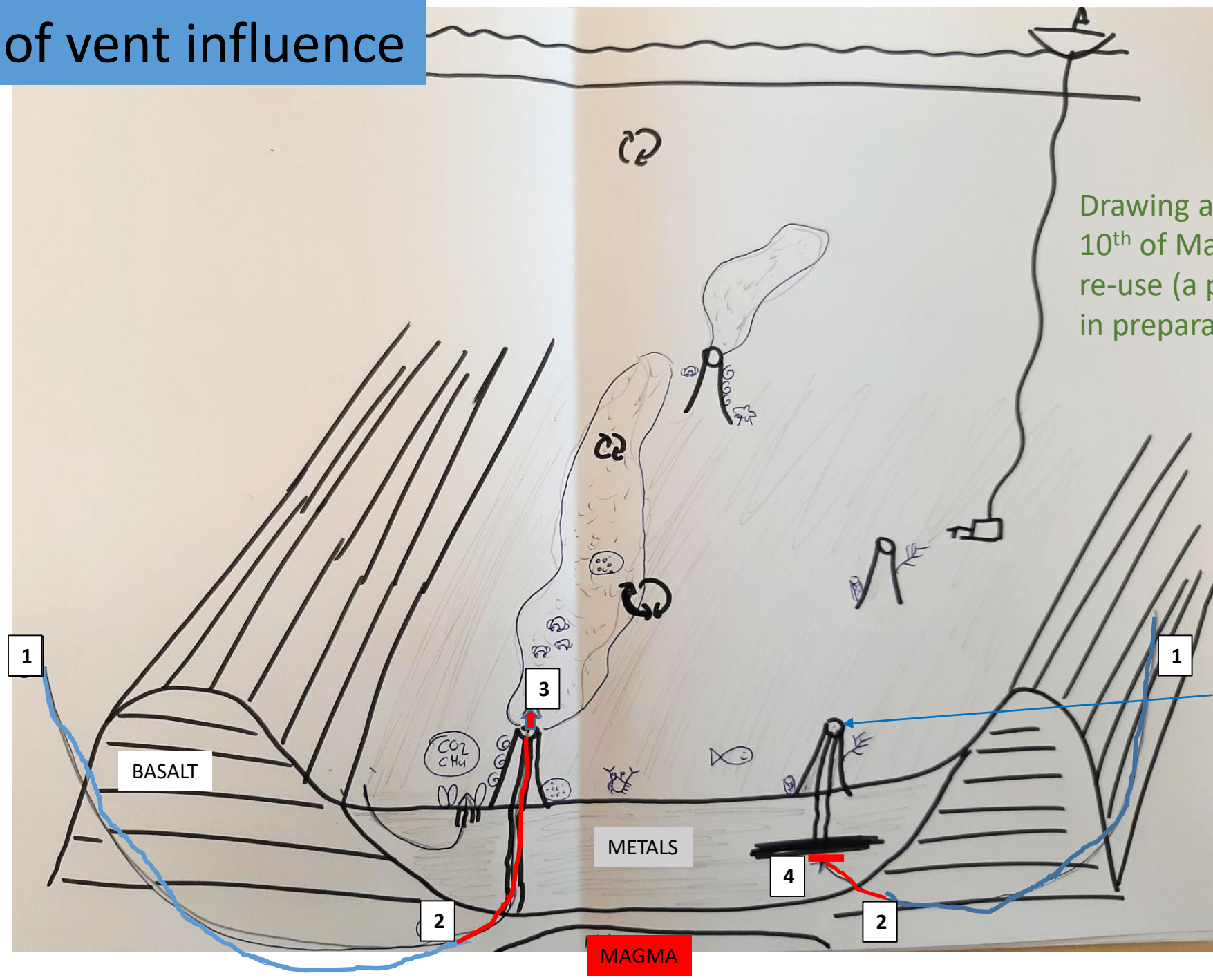
Assumption: There is a need to define the 3-D space that protects the unique and fragile active vent to safeguard the high ecosystem services.

Goal: A standardized approach to define this 3-D space that may be applied by different bodies.

The sphere of vent influence

The vent ecosystem:

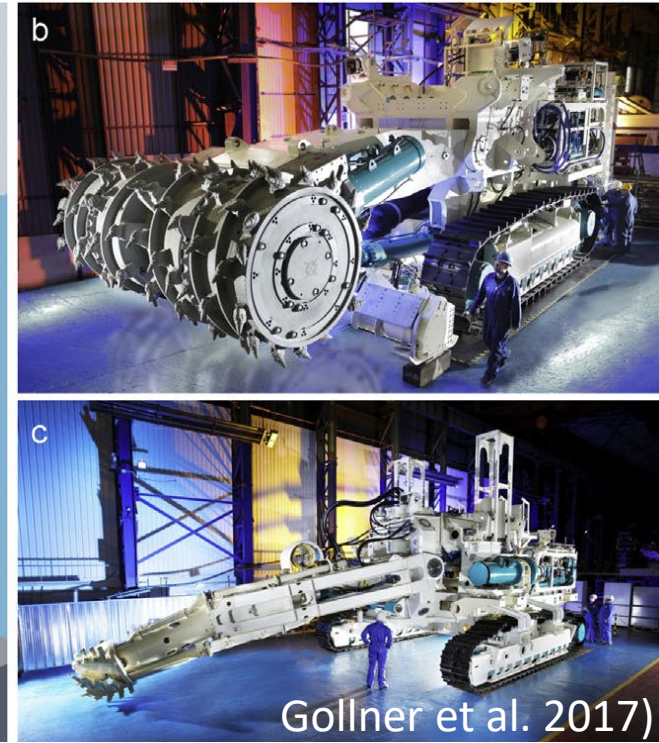
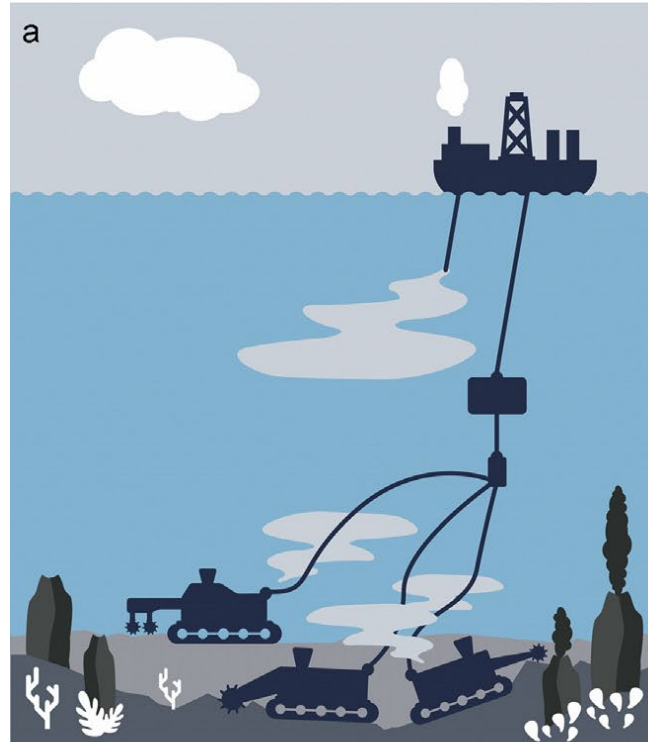
- Active & inactive deposits can be spatially close.
- The subseafloor, seafloor and water column are geologically and biologically connected.
- Biodiversity and function are connected.



Drawing as presented on 10th of May 2023 not for re-use (a proper figure is in preparation)

Environmental mining impacts

- Removal of mineral resource
->Habitat loss, fragmentation, modification
- Change of vent fluid conditions
->community change, as vent endemic organisms are adapted to certain environmental conditions
- Sediment plumes (vehicle & return plume)
->burial, clogging of filter apparatus, toxic effects (especially VME species at inactive vents; effects on larvae?)
- Sound & Light
->shallow water animals (same faunal groups) use sound as trigger for settlement



What area would need protection?

Only considering the active vents

During the presentation on 10th of may 2023, a preliminary table was presented that relates ecosystem services to sphere of vent influence (the vent ecosphere) and how they might be impacted by extractive industries. Based on the vent ecosphere, spatial protection measures including the seafloor, sub-seafloor and water column were discussed. A more advanced table is currently in preparation.

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->Lise Klunder: Case study Rainbow Vent



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