



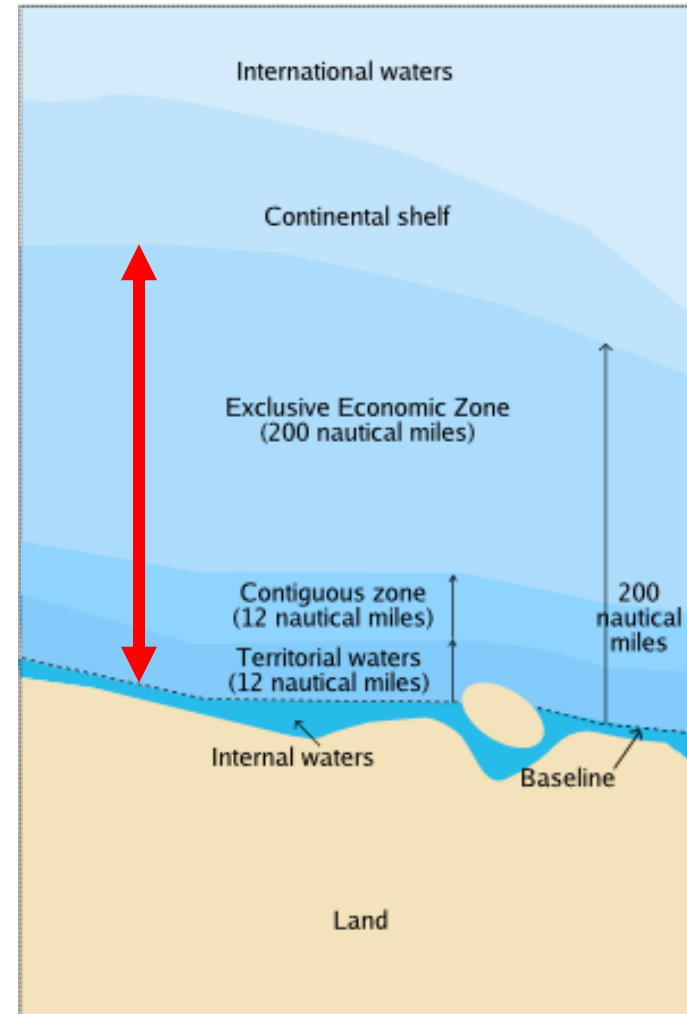
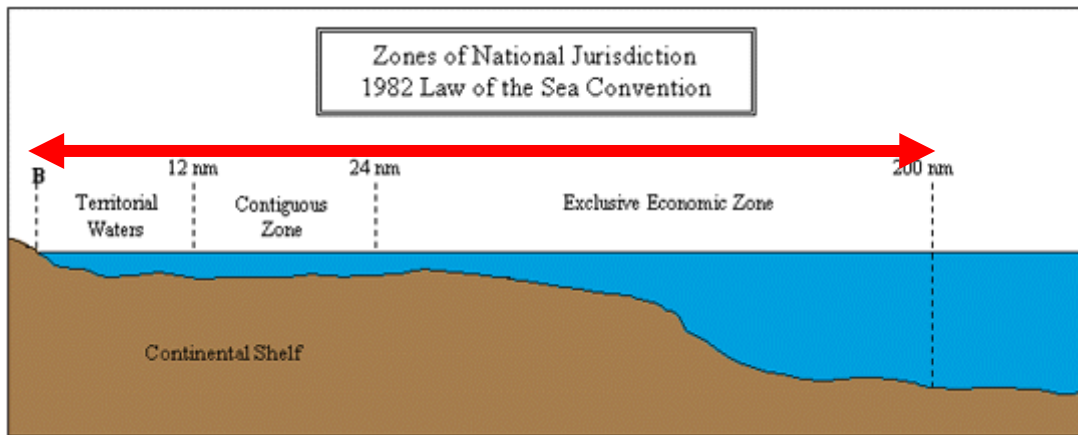
Nodules, crusts, sulfides: Marine resources in the glance of exploration licenses with the International Seabed Authority

Workshop on best practices on
mining policies and technologies
12 & 13 June 2014 | Brussels



United Nations Convention on the Law of the Sea (UNCLOS)

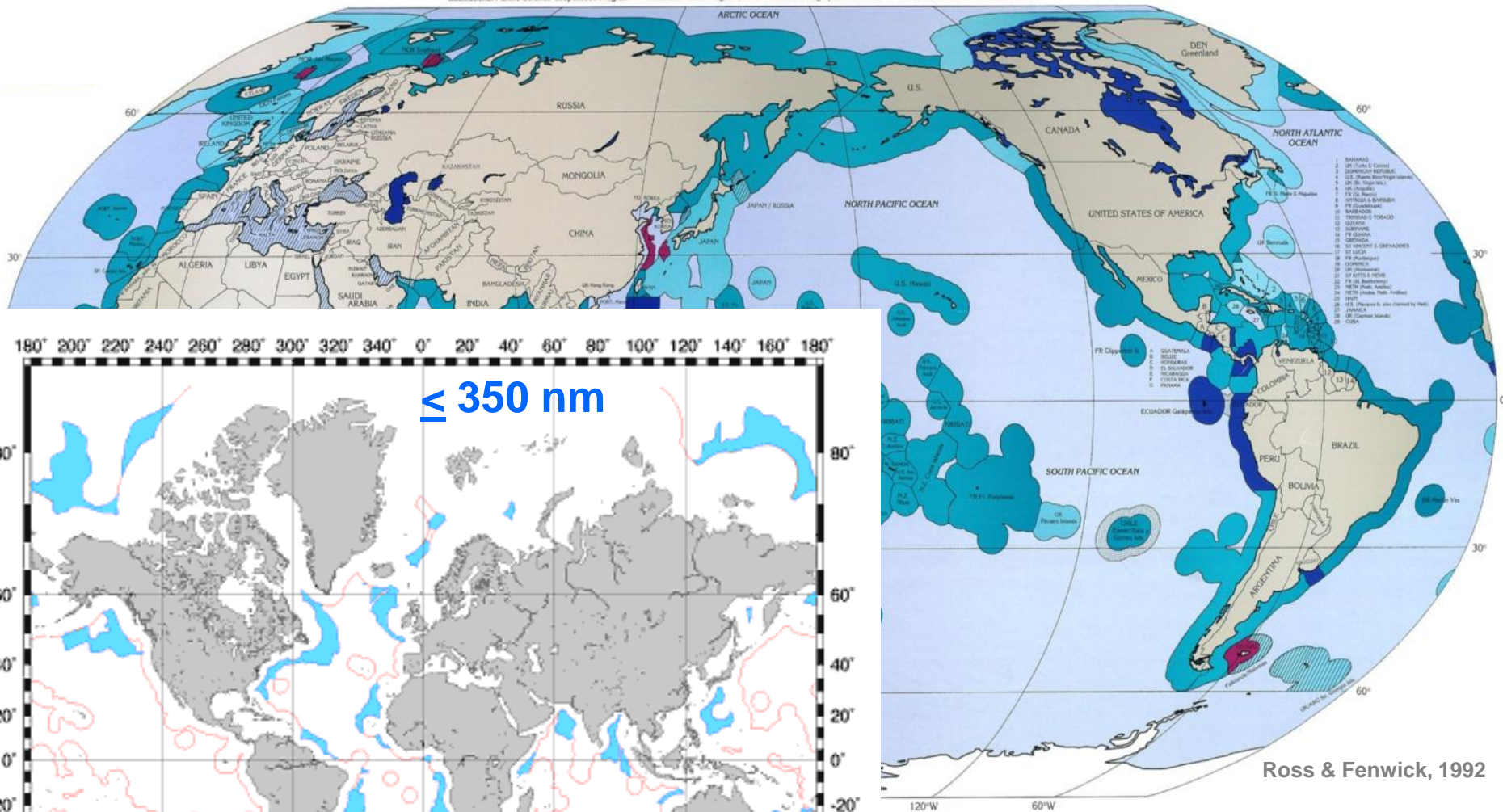
EEZ – exclusive economic zone



Maritime Claims and Marine Scientific Research Jurisdiction

DAVID A. ROSS AND JUDITH FENWICK

International Marine Science Cooperation Program • WHOI Sea Grant Program, Woods Hole Oceanographic Institution • Woods Hole, Massachusetts 02543 USA



Ross & Fenwick, 1992

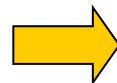
Major change in 1994
EEZ extension

Major change: 1994

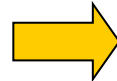


International Seabed Authority (ISA)
Kingston, Jamaica

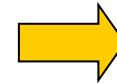
Responsibility: Mineral Resources



Controlling activities in “the area“



Defining regulations for usage



**Resource types: Polymetallic nodules
Cobalt-rich crusts
Polymetallic sulfides**



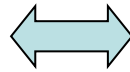
**Regulations for exploration
in place**



International Seabed Authority



Council
(48 delegations)



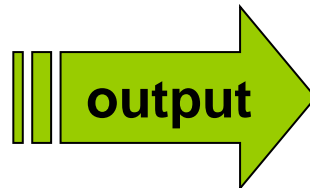
Legal and Technical Commission
(24 members)



Assembly
(~166 delegations)



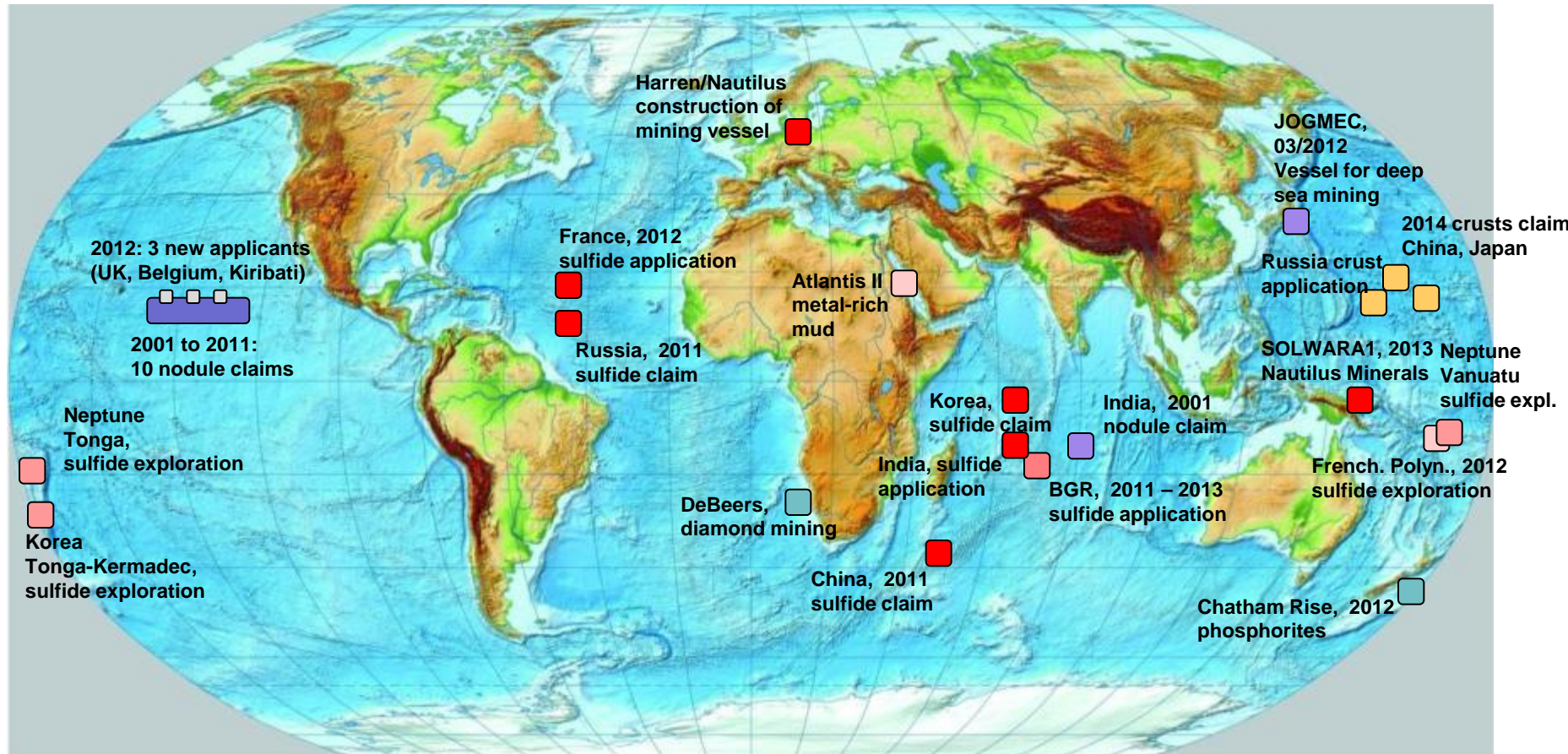
Workshops



Regulations
Advice
Executive action

International Trends

Trends in marine mining: claims, exploration, vessel construction



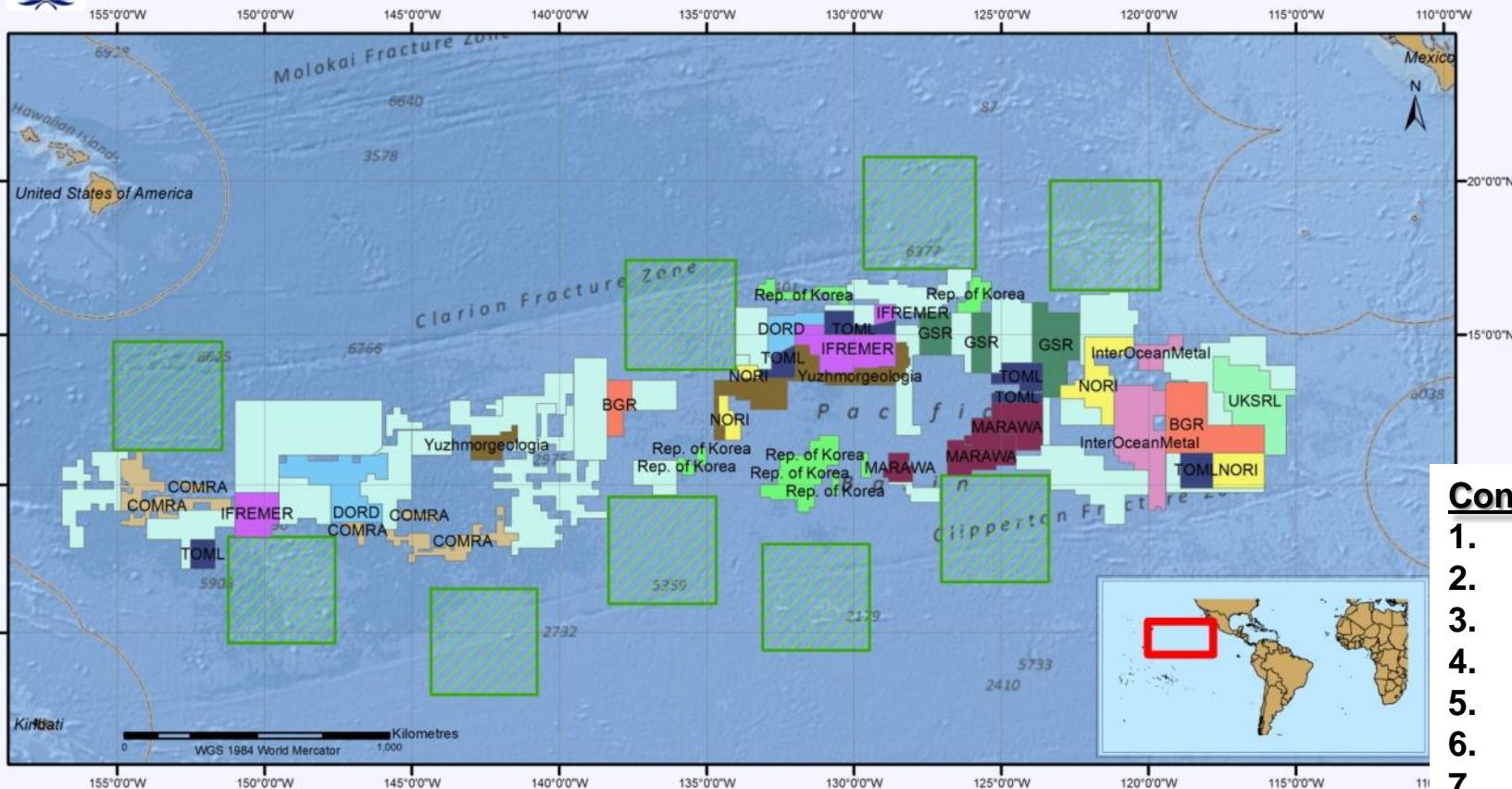
Additional claims in 2013: 2x nodules (Singapore, UK), 2x sulfides (Germany, India), 3x crusts (China, Japan, Russia)

License areas in the Clarion-Clipperton nodule belt



Polymetallic Nodules Exploration Areas in the Clarion-Clipperton Fracture Zone

Areas under contract and areas reserved for the International Seabed Authority



Contractors:

1. S-Korea
2. IOM
3. China
4. Russia
5. France
6. Japan
7. India
8. Germany
9. Nauru
10. Tonga
11. UK
12. Belgium
13. Kiribati
14. (Singapore)
15. (UK)

Contract area or contract approved as of 28 February 2013

Marawa Research and Exploration Ltd (Kiribati)	Institut français de recherche pour l'exploitation de la mer (IFREMER; France)
Bundesanstalt für Geowissenschaften und Rohstoffe (BGR; Germany)	InterOceanmetal (IOM; Bulgaria, Cuba, Czech Republic, Poland, Russian Fed., Slovak)
China Ocean Mineral Resources Research and Development Association (COMRA; China)	Nauru Ocean Resources Inc. (NORI; Nauru)
Deep Ocean Resources Development Company (DORD; Japan)	Tonga Offshore Mining Ltd (TOML, Tonga)
G-TEC Minerals Resources NV (GSR; Belgium)	UK Seabed Resources Ltd (UKSRL, UK)
Government of the Republic of Korea	Yuzhmorgeologia (Russian Federation)

Reserved area* Area of particular environmental interest (APEI)** Exclusive Economic Zones (VLIZ, 2011)

* In the case of polymetallic nodules, the so-called parallel system provides that each application for exploration by a developed State must cover two parts of "equal estimated commercial value". One part is allocated to the applicant and the other is to become the reserved area, which is set aside for the conduct of activities by the Authority or developing States.

** In July 2012, the Authority adopted an environmental management plan for the Clarion-Clipperton Zone to be implemented on a provisional basis over an initial three-year period. The plan includes the designation of a network of areas of particular environmental interest (ISBA/18/C/22).

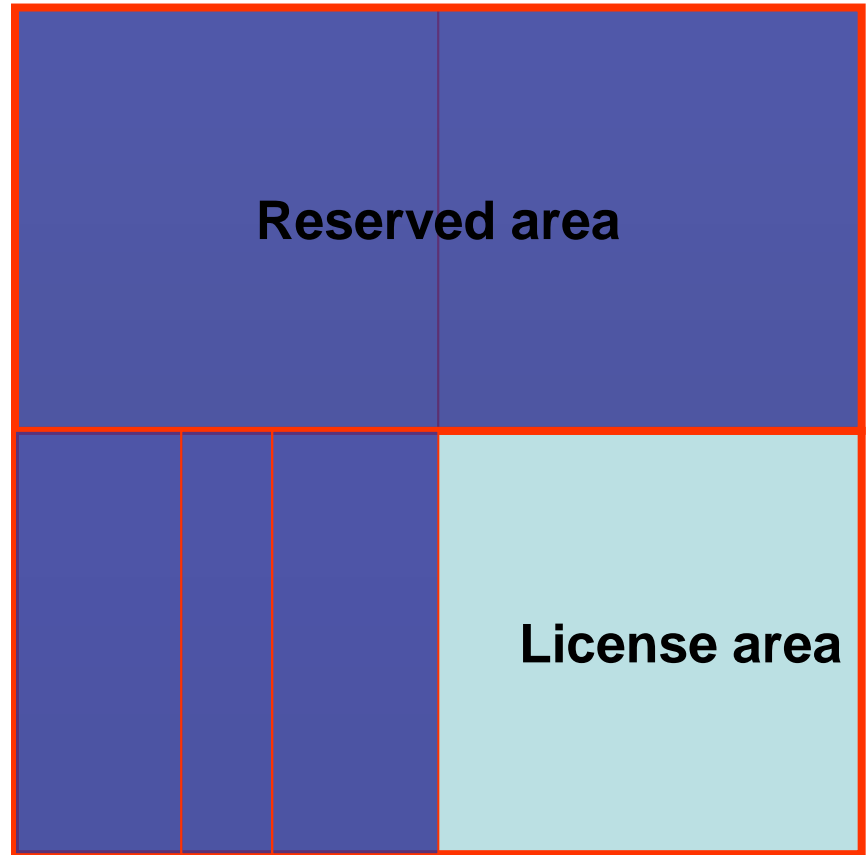
Manganese Nodules

Exploration area

- a) Apply for up to 300,000 km²
- b) 50% becomes license area;
other part is 'reserved area'

Relinquishment in 8 years

- a) Reduce size during exploration
after 3 years: 20%
- b) Further reduction
after 5 years: 10%
- c) Further reduction
after 8 years: 20%



Area of 75,000 km²

Requirements for regulations

- **Small 3-dimensional bodies => smaller exploration areas**
- **No cherry picking of sites by one contractor => contiguous area**
- **Avoid influence on ecosystem of vents => obligations already for prospectors**



Area

Environment

Participation

a) area: 100 blocks (each 10x10 km)

b) contiguity

c) restricted to 1,000 x 300 km extension

d) obligations for prospectors

e) initial fee or annual fee

f) reserved area or

equity interest in joint venture

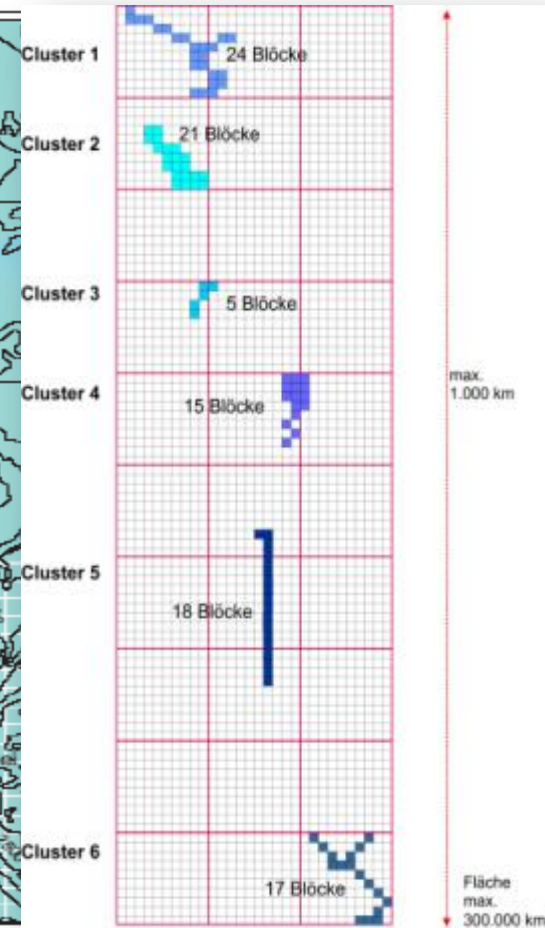
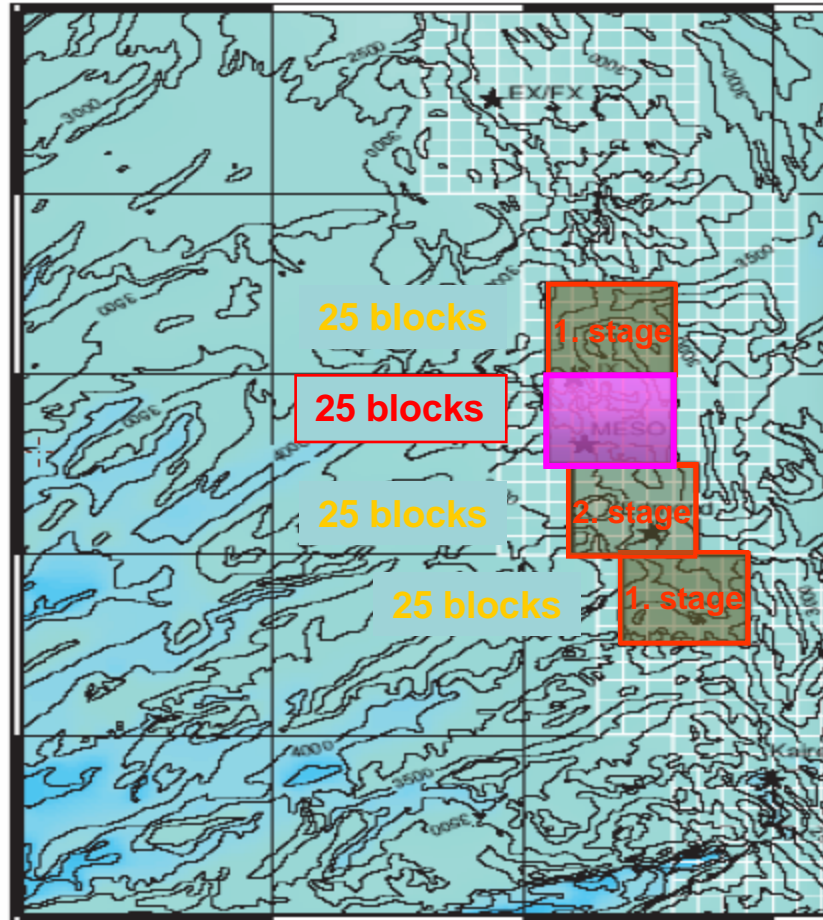
Polymetallic Sulfides

Exploration area:
10,000 km²
(1,000 x 300 km)

100 blocks,
at least 5
contiguous blocks,
each block
10x10 km

8 yrs: 50%

10 yrs: 75%



After 10 yrs: 25 blocks, 2.500 km² area



Co-rich Crusts



Co up to **2.0 %**
(0.5 %)

Ni **0.35 %**

Ce **0.1 %**

Pt **350-570 ppb**

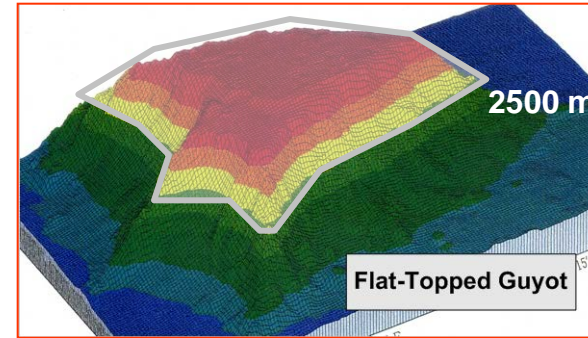
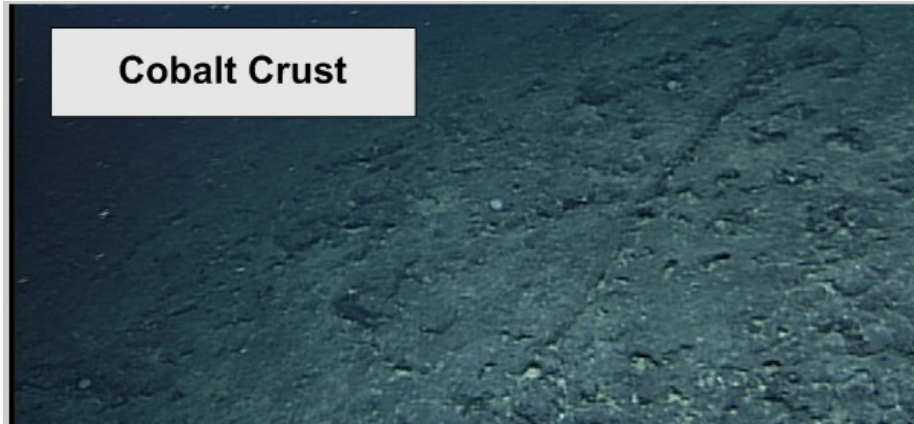


growth rates:
~2 – 12 mm/Ma

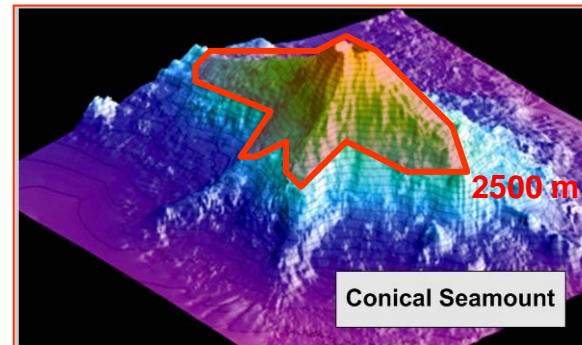
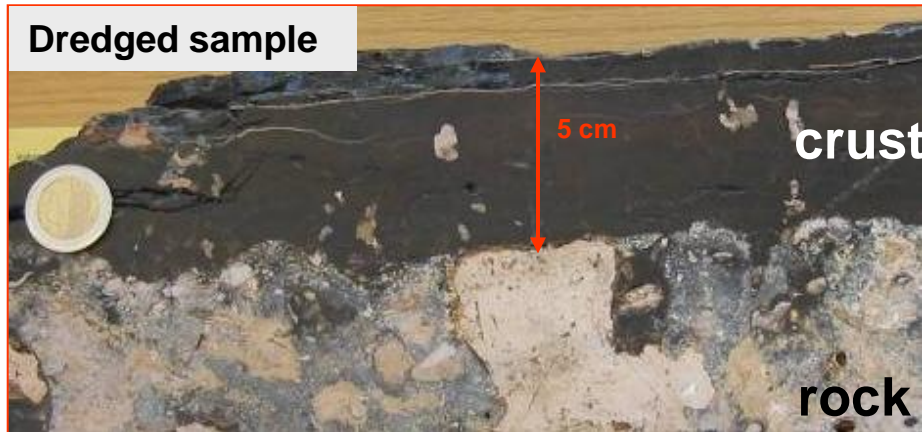
crust

rock

Co-rich Crusts



large shallow flat area



small steep + deep area

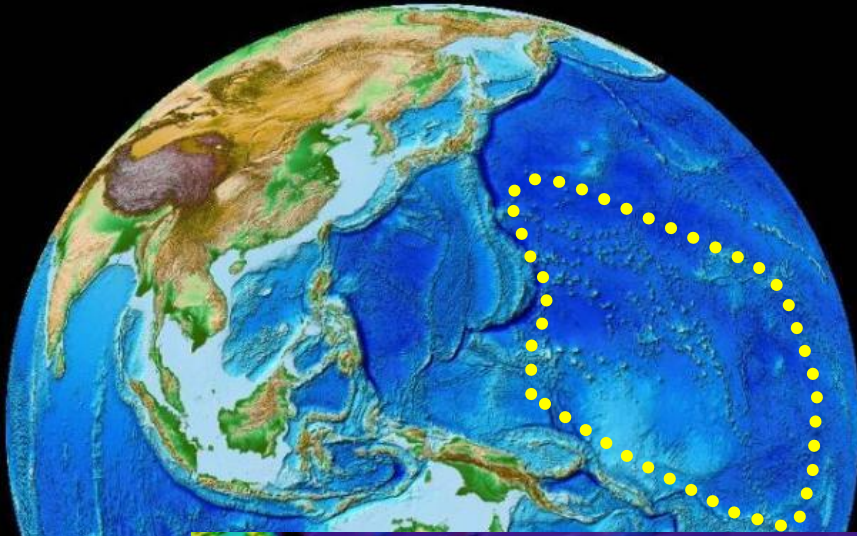


upper part of seamounts (< 2500 m water depth)

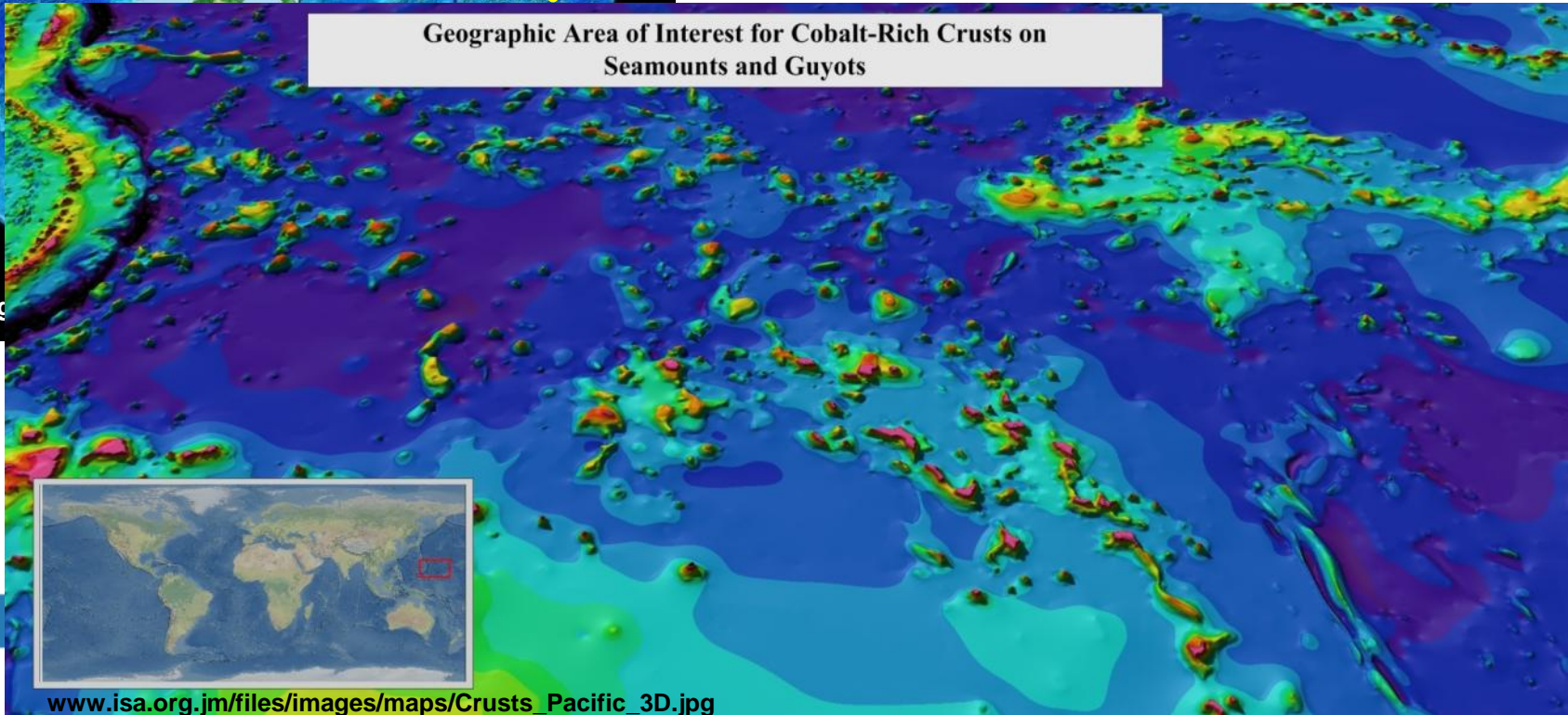
Co-rich Crusts

Target area W-Pacific

- Oldest seamounts
- thickest crusts
- 800 – 2,500 m water depth



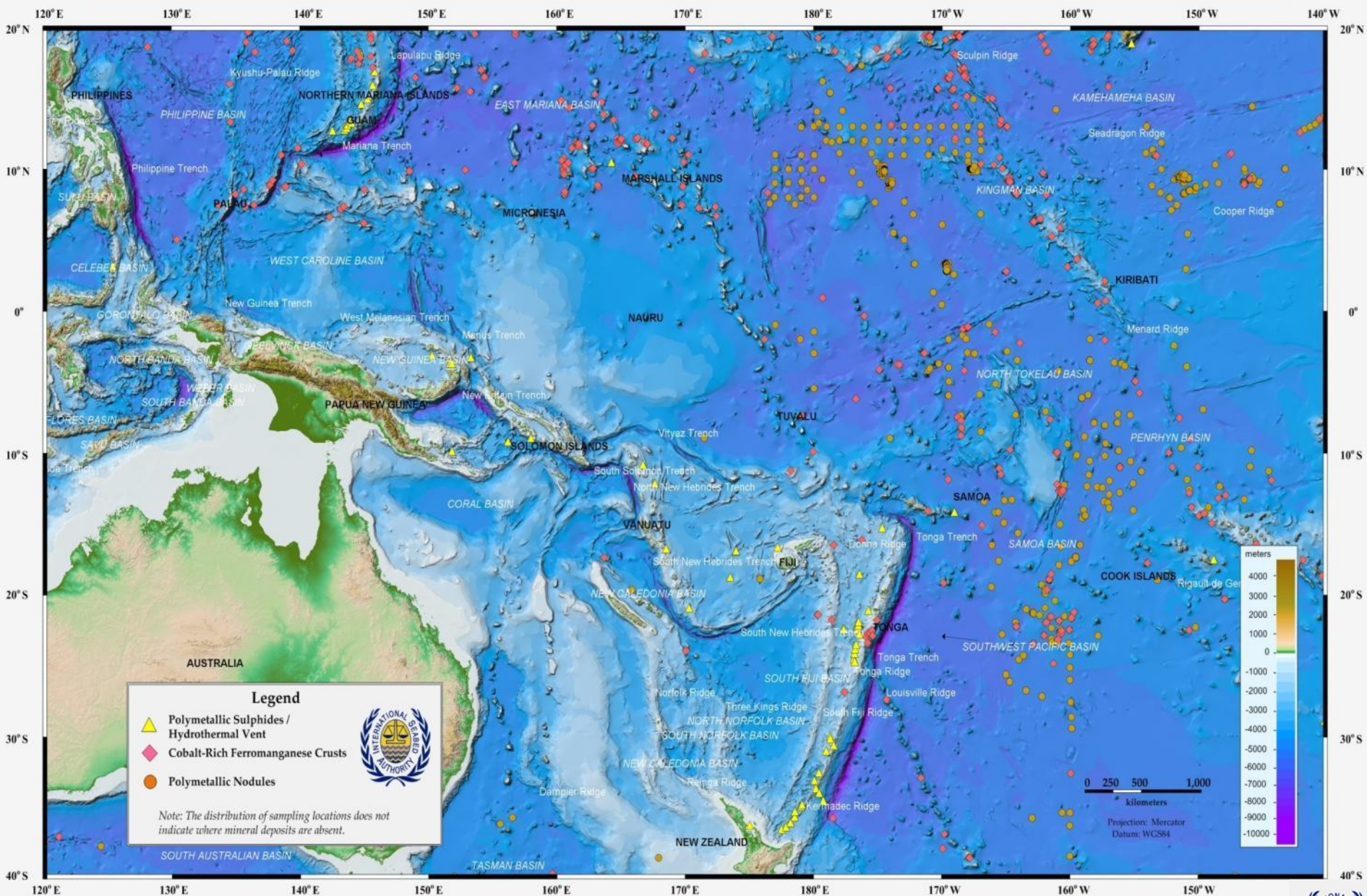
Geographic Area of Interest for Cobalt-Rich Crusts on Seamounts and Guyots



www.isa.org.jm/files/images/maps/Crusts_Pacific_3D.jpg

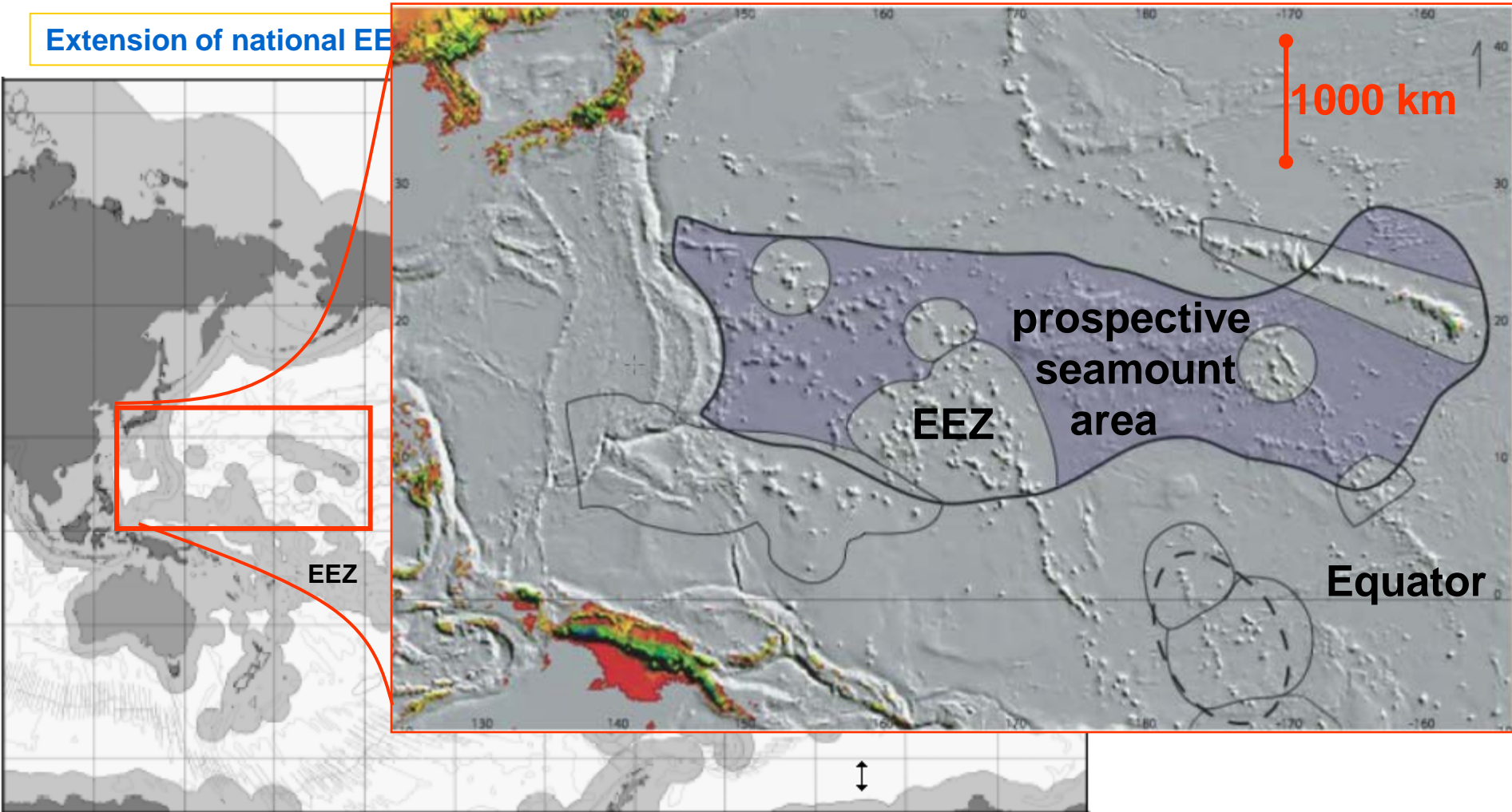
www.ngdc.noaa.gov

MINERAL RESOURCES IN THE SOUTH PACIFIC OCEAN – SAMPLING LOCATIONS FROM THE ISA CENTRAL DATA REPOSITORY



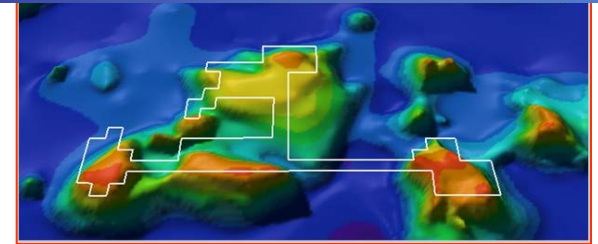
Co-rich Crusts

Extension of national EEZ



Exploration area

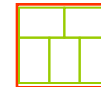
- a) exploration area: 550 x 550 km
- b) 150 blocks (à 20 km²)
- c) 5 contiguous blocks form cluster (5 clusters), (clusters need not be contiguous)
- d) each block composed of contiguous sub-blocks (20 km²)
- e) reserved area or joint venture
- f) during 10 years: relinquish $\frac{2}{3}$ of area
- g) further reduction to final mine size (1,000 km²)



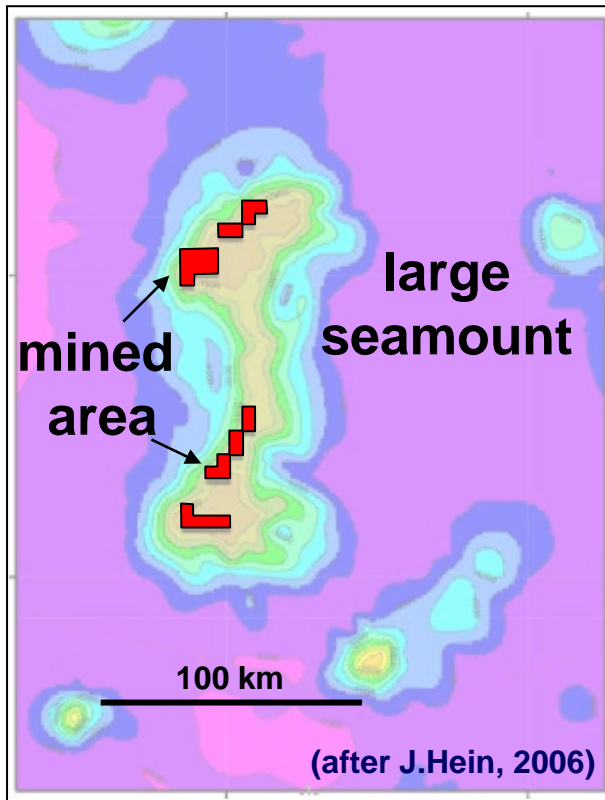
150 x 1 block

5 x cluster

1 block 1 block 1 block 1 block



Co-rich Crusts



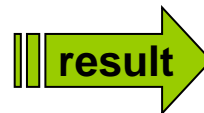
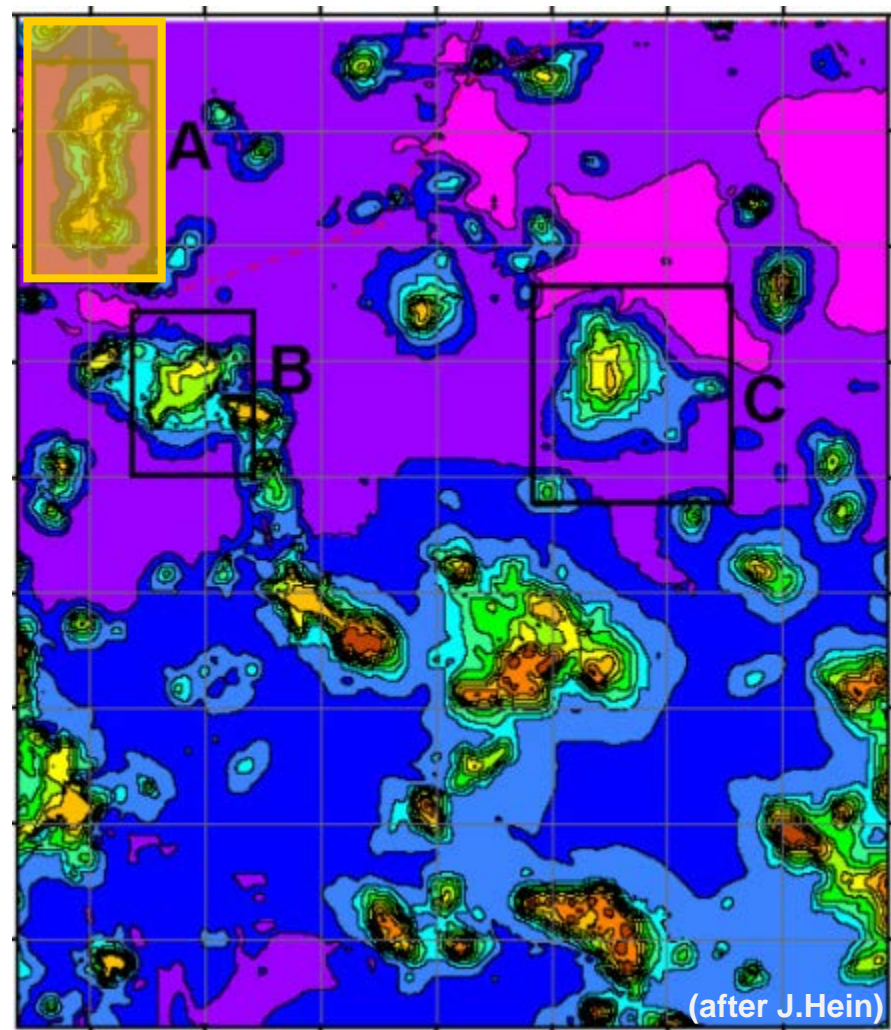
Large composite seamount

Crust 2-3 cm thick,

Area above 2.5 km ~ 2900 km²

Area mined per year ~25 km²

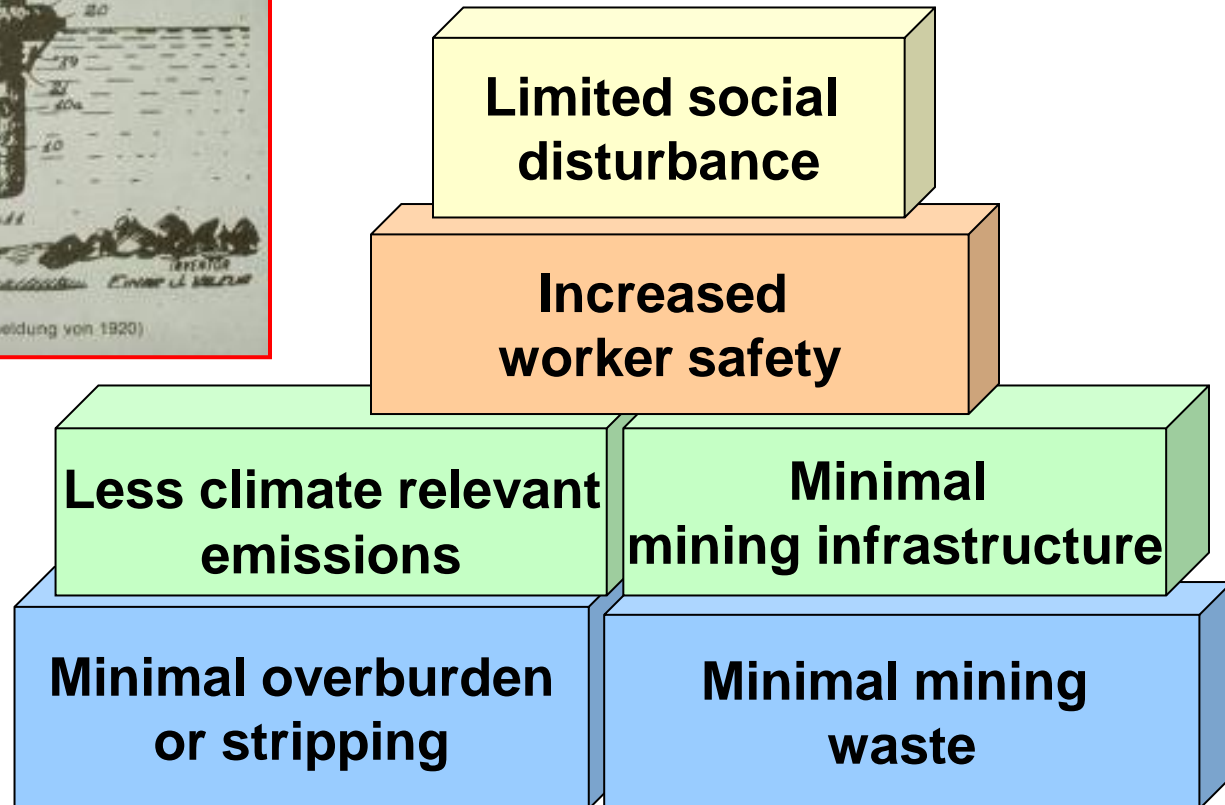
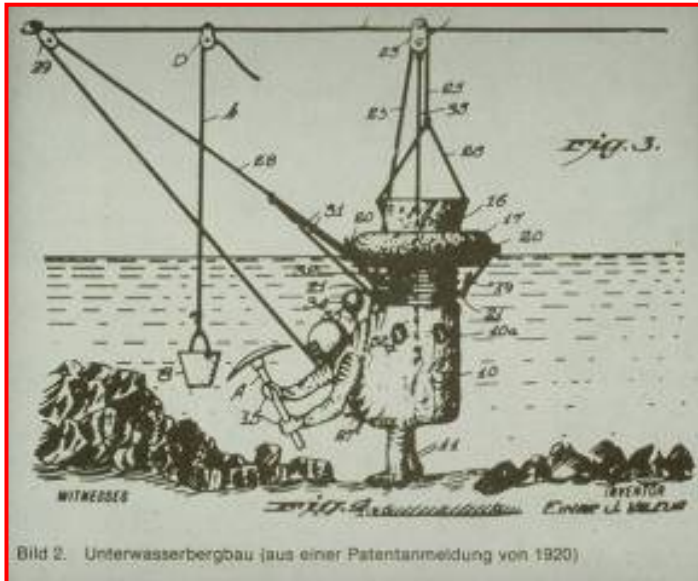
in 20 yrs. ~500 km²



can accommodate a
single 20-years mining site

Model mine site at seamount

Six Advantages of Seafloor Mining



Thank You !



c.f. www.isa.org.jm

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