frontiers

Supplementary Material

Seafloor Observation Scenario Exploration Tool: Enabling Representative Exploration of the Global Deep Seafloor

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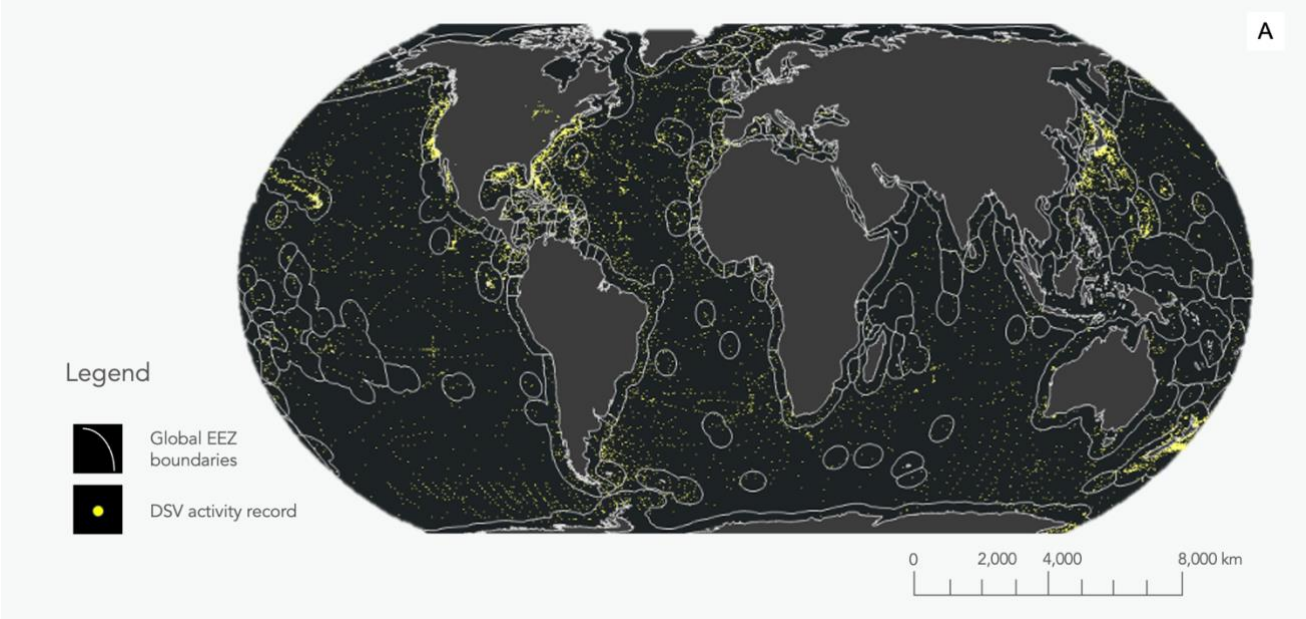
1. Access to the Seafloor Observation Scenario Exploration Tool

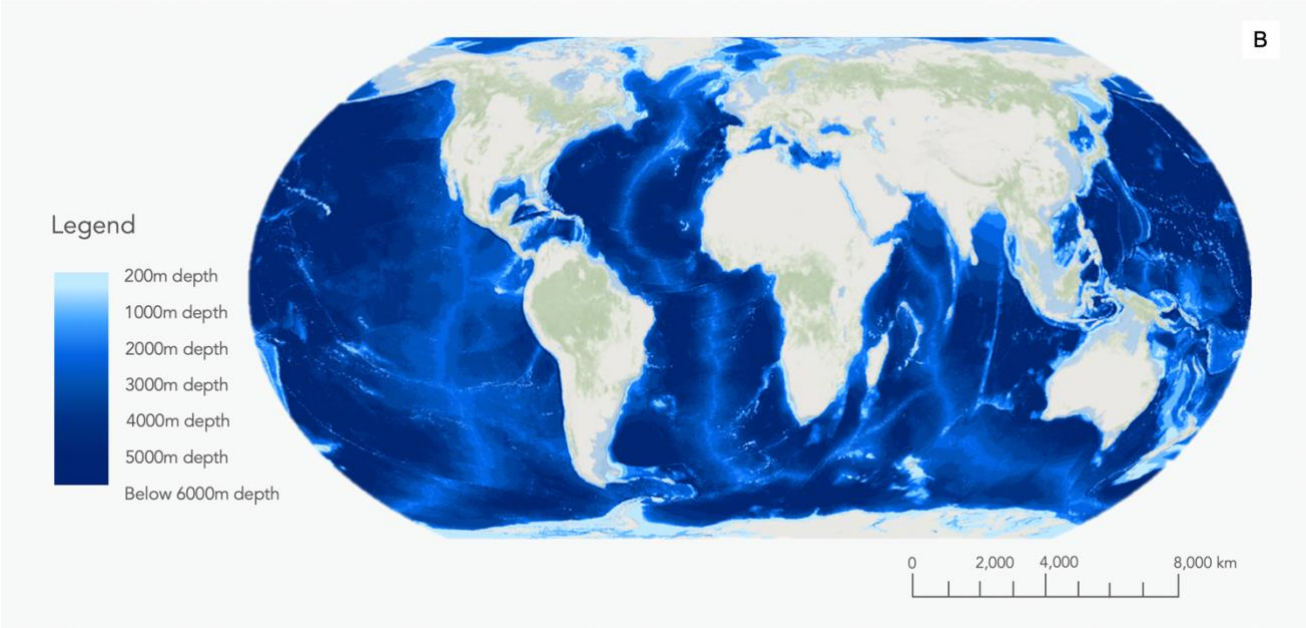
The prototype *Seafloor Observation Scenario Exploration Tool* can be accessed at http://bit.ly/seafloor-tool. Datasets visualized within the tool are available through the Ersi Living Atlas.

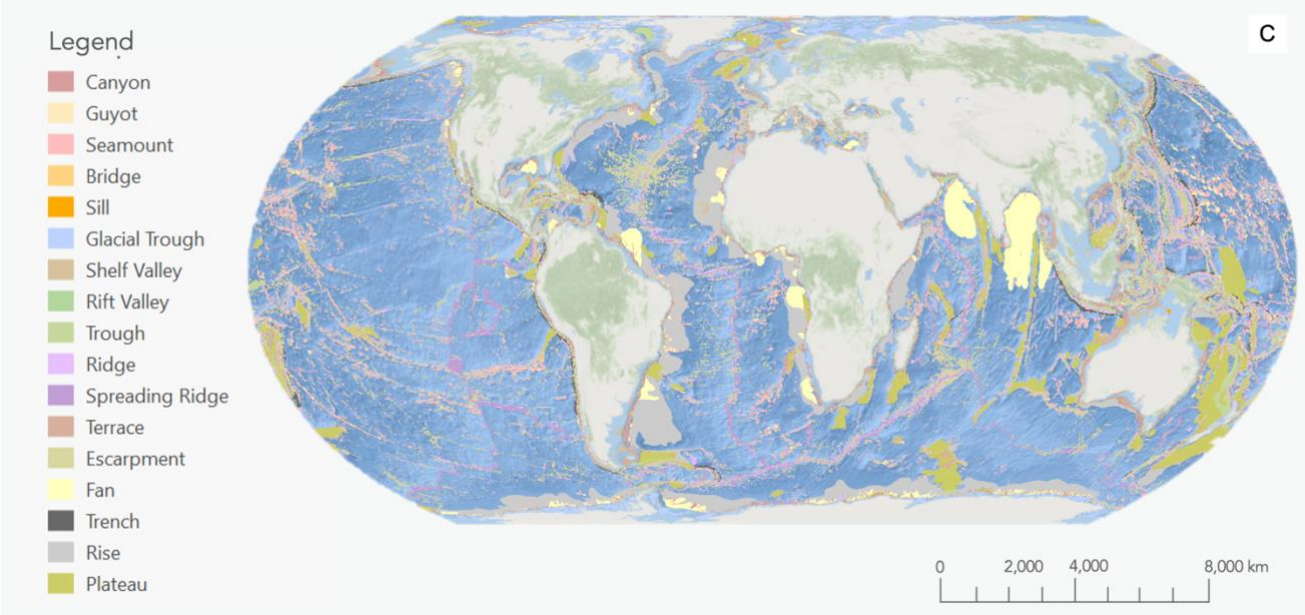
2. Supplementary Tables and Figures

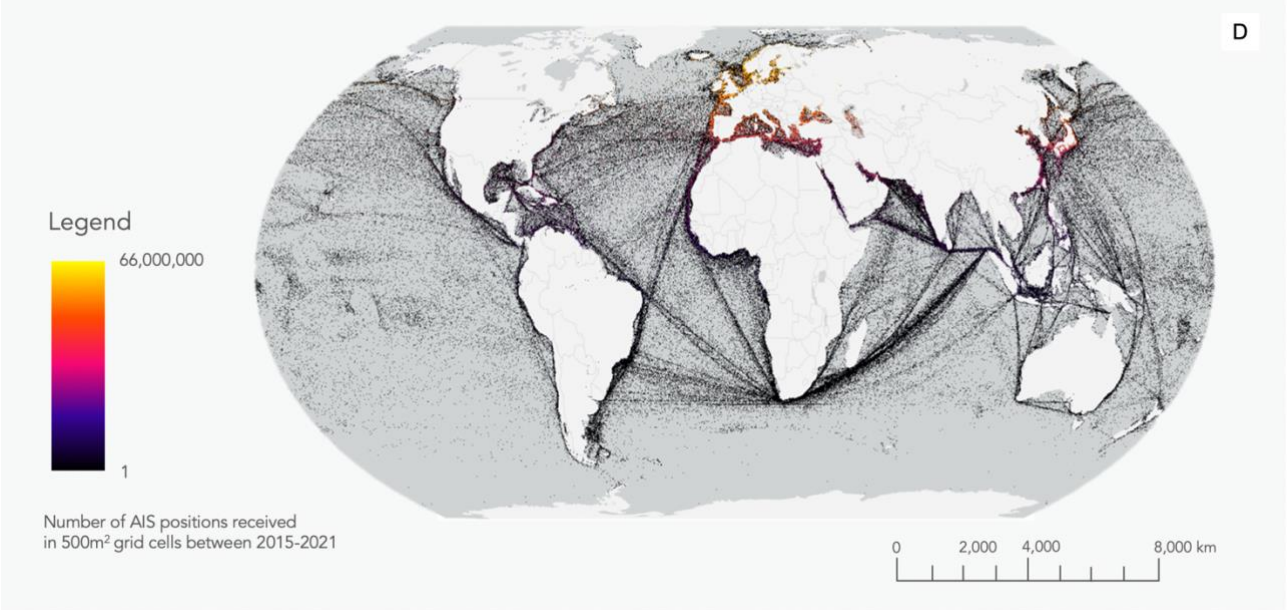
Supplementary Table 1. Institutional sources of and platforms for deep submergence seafloor exploration metadata.

Institution (Country)	Type of platform(s)
China Ocean Mineral Resources Research and Development Association (The Peoples Republic of China)	Camera tow
Commonwealth Scientific and Industrial Research Organization (Australia)	Camera tow
GEOMAR Helmholtz Center for Ocean Research (Germany)	HOV, ROV
Global Sea Mineral Resources (Belgium)	AUV
Harbor Branch Oceanographic Institute (USA)	HOV
Hawaii Undersea Research Laboratory (USA)	HOV, ROV
Institut Français de Recherche pour l'Exploitation de la Mer (France)	HOV, ROV, AUV, Camera tow
Japan Agency for Marine-Earth Science and Technology (Japan)	HOV, ROV, AUV, Camera tow
Joint Usage/Research Center for Atmosphere and Ocean Science (Japan)	HOV, ROV
Lamont-Doherty Earth Observatory (USA)	Camera tow, Benthic camera stn
Monterey Bay Aquarium Research Institute (USA)	ROV
National Deep Submergence Facility (USA)	HOV, ROV, AUV, Camera tow
National Institute of Water and Atmospheric Research (New Zealand)	Camera tow
NOAA Ocean Exploration (USA)	ROV
National Oceanography Center (UK)	ROV
National Science and Technology Council (Taiwan)	Camera tow
Ocean Exploration Trust (USA)	ROV
Russian Academy of Sciences (Russia)	HOV
Schmidt Ocean Institute (USA)	ROV
The Peoples Republic of China (China)	HOV, ROV, Camera tow

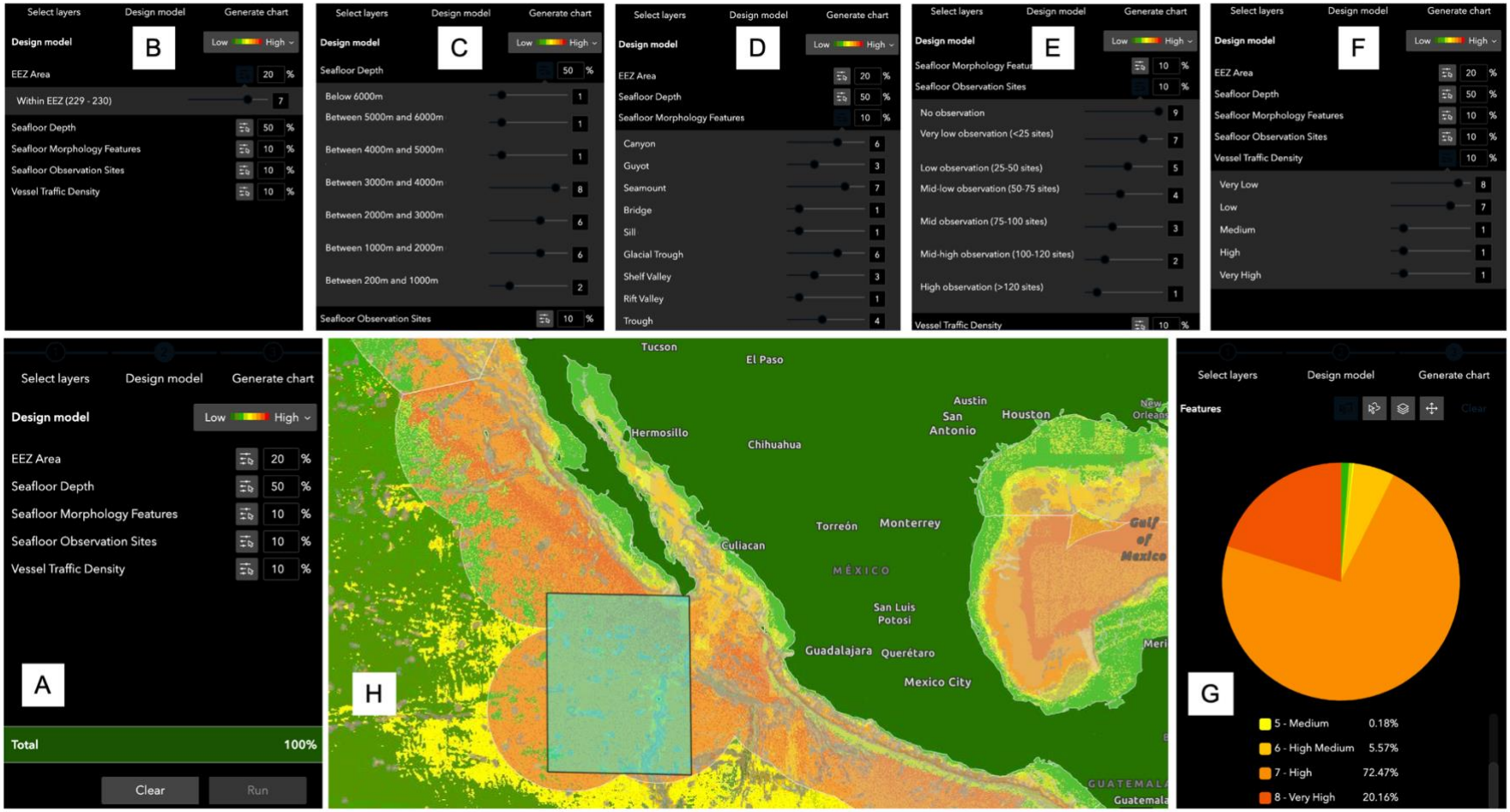

A
Legend
Global EEZ boundaries
DSV activity record
0
2,000
4,000
8,000 km


B
Legend
200m depth
1000m depth
2000m depth
3000m depth
4000m depth
5000m depth
Below 6000m depth
0
2,000
4,000
8,000 km





Supplementary Figure 1. Visualizations of data layers with detailed legend information: (A) Locations of ROV, AUV, HOV dives, benthic landers, and tows used in seafloor observation metadata set (adapted from Kennedy & Rotjan, in review) overlaid with Global Exclusive Economic Zone boundaries (Flanders Marine Institute, 2019), all superimposed on the Esri dark base map. Individual yellow points represent individual dive sites; white lines represent EEZ boundaries. (B) Global deep ocean bathymetry data derived from the General Bathymetric Chart of the Oceans (GEBCO, 2021) superimposed on the Esri world oceans base map. (C) World Seafloor Geomorphology features (Harris et al. 2014), superimposed on the Esri World Oceans base map. (D) density of global vessel traffic from 2015-2021, as AIS positions recorded within 500m^2 cells (Cerdeiro et al., 2020). Density data superimposed on the Esri grey canvas base map.


Select layers
Design model
Generate chart
Design model
Low
High
EEZ Area
20
%
Seafloor Depth
50
%
Seafloor Morphology Features
10
%
Seafloor Observation Sites
10
%
Vessel Traffic Density
10
%
A
Total
100%
Clear
Run
B
Within EEZ (229 - 230)
7
C
Seafloor Depth
Below 6000m
1
Between 5000m and 6000m
1
Between 4000m and 5000m
1
Between 3000m and 4000m
8
Between 2000m and 3000m
6
Between 1000m and 2000m
6
Between 200m and 1000m
2
D
Canyon
6
Guyot
3
Seamount
7
Bridge
1
Sill
1
Glacial Trough
6
Shelf Valley
3
Rift Valley
1
Trough
4
E
No observation
9
Very low observation (<25 sites)
7
Low observation (25-50 sites)
5
Mid-low observation (50-75 sites)
4
Mid observation (75-100 sites)
3
Mid-high observation (100-120 sites)
2
High observation (>120 sites)
1
F
Very Low
8
Low
7
Medium
1
High
1
Very High
1
H
Tucson
El Paso
Hermosillo
Chihuahua
Austin
San Antonio
Houston
Torreón
Monterrey
Culiacan
MÉXICO
San Luis Potosí
Guadalajara
Querétaro
Mexico City
Gulf of Mexico
GUATEMALA
Guatemala
G
Features
5 - Medium
0.18%
6 - High Medium
5.57%
7 - High
72.47%
8 - Very High
20.16%

Supplementary Figure 2. Clockwise from bottom left: (A) After choosing global information layers of interest, users can assign different levels of importance to each layer by assigning a greater or lesser percentage contribution to the model. (B) Slider interface to increase (larger values) or decrease (smaller values) the weight of within-EEZ regions in the model. (C) Slider interface to increase (larger values) or decrease (smaller values) the weight of specific depth ranges in the model. (D) Slider interface to increase (larger values) or decrease (smaller values) the weight of individual seafloor geomorphology features in the model. (E) Slider interface to increase (larger values) or decrease (smaller values) the weight of the density of previous seafloor exploration in the model. (F) Slider interface to increase (larger values) or decrease (smaller values) the weight of vessel traffic density in the model. (G) Suitability breakdown pie chart for the user-drawn region of interest within the EEZ of Mexico. (H) Heatmap of suitability for a user-drawn region of interest within the EEZ of Mexico.