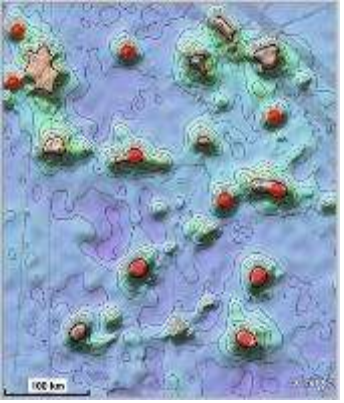
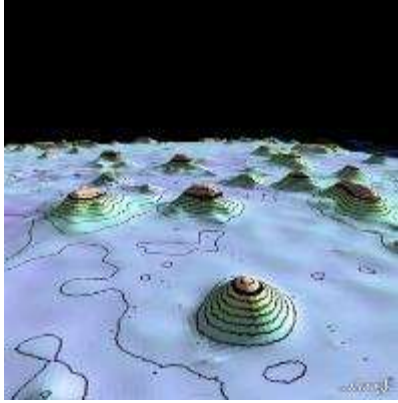
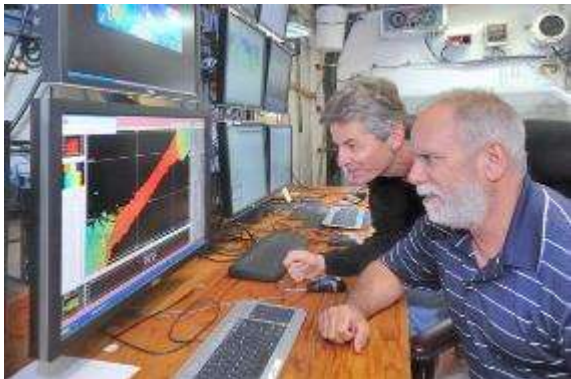


GEBCO Data Store & SRTM15_PLUS

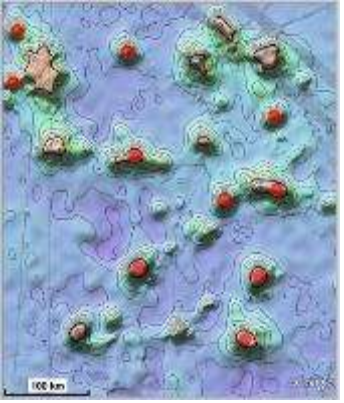
David T. Sandwell - Scripps Institution of Oceanography
Joseph J. Becker - Naval Research Laboratory
Chris Olson - Scripps Institution of Oceanography



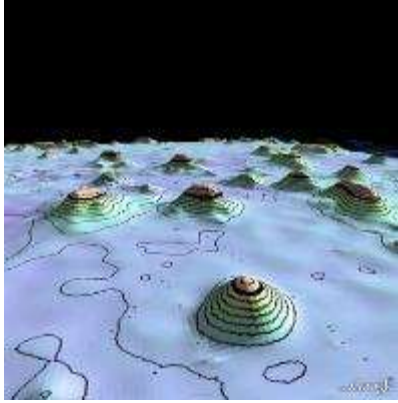
- Needs for improved bathymetry
- Three resolutions: 60 sec, 30 sec, 15 sec
- Data Store Contributions
- Editing for 15 sec
- How can we do better?



Funding: Google, NSF, ONR, ConocoPhillips



Needs for Improved Bathymetry



Science

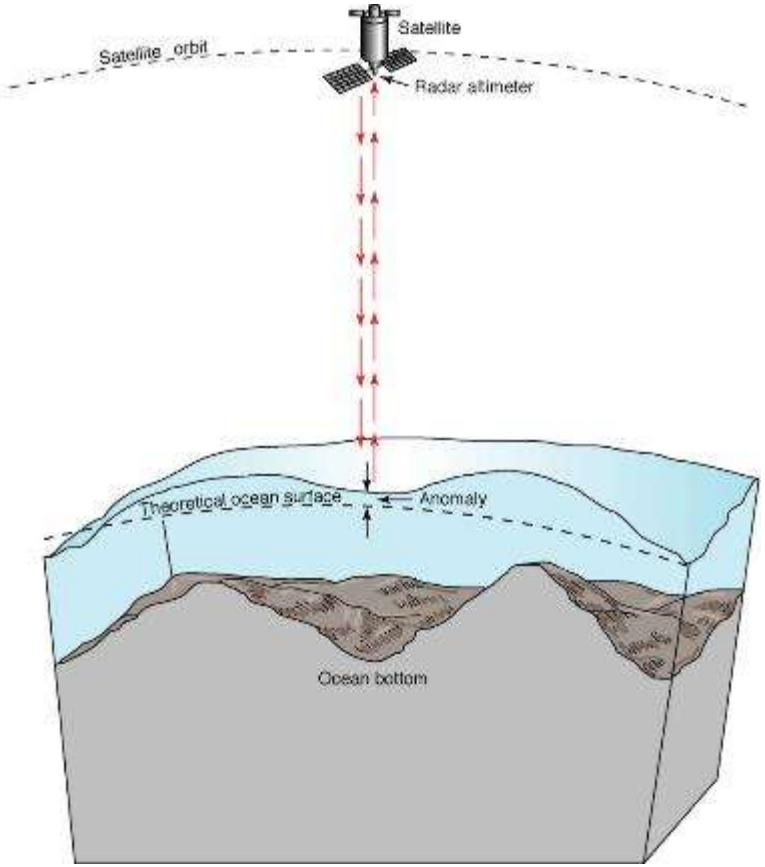
- **global tectonics, seafloor roughness, fractures**
- seamounts
- tsunami models
- ocean circulation and tides
- marine ecosystems
- planning tool

Outreach and applications

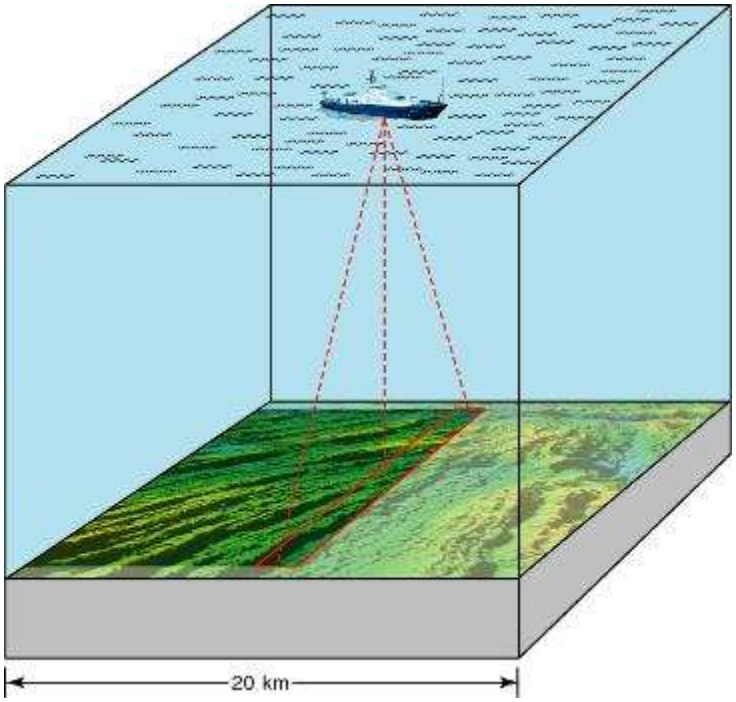
- education and outreach - GE
- military applications
- industry applications

modern mapping tools

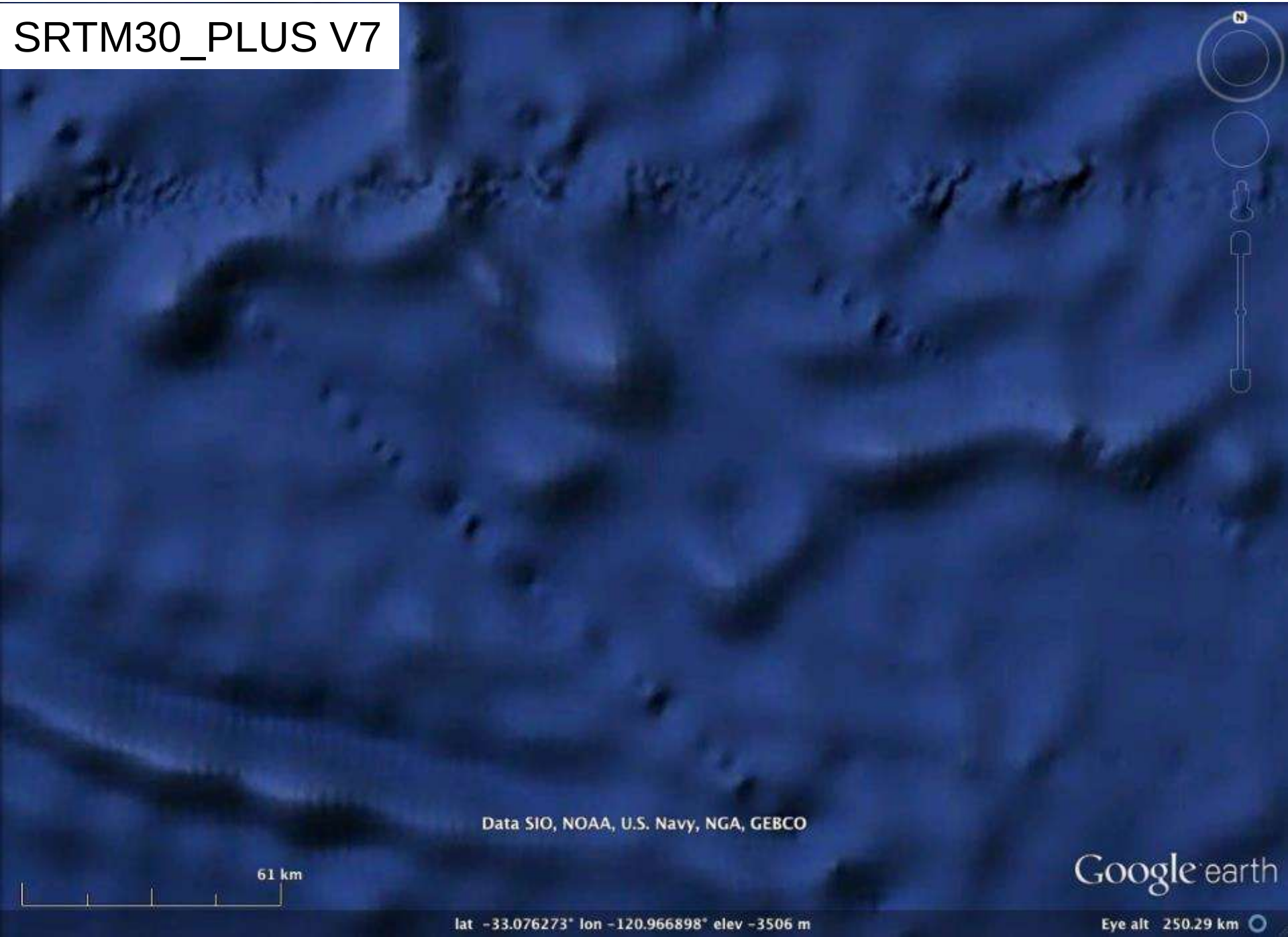
satellite altimeter



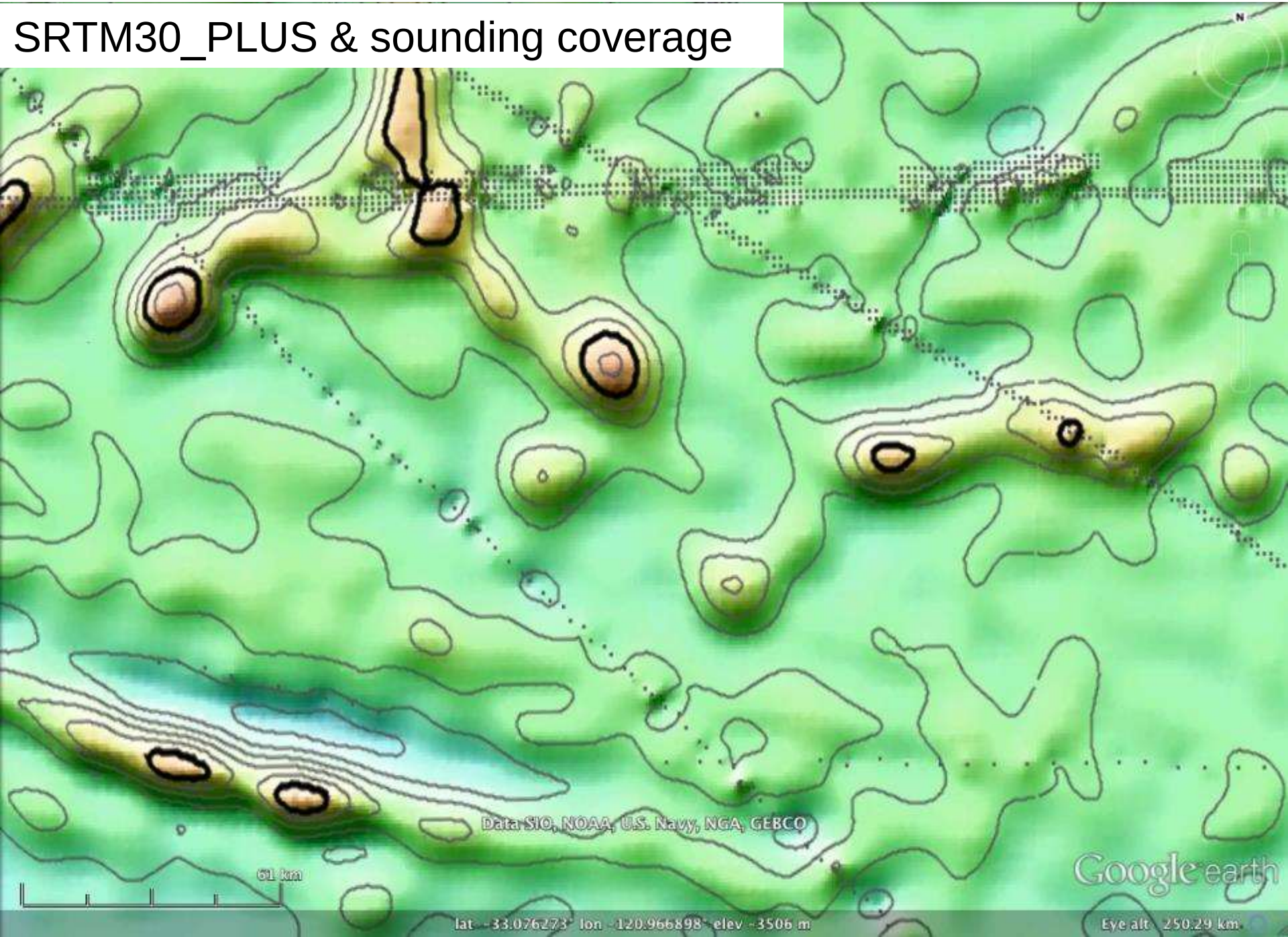
multibeam echo sounder

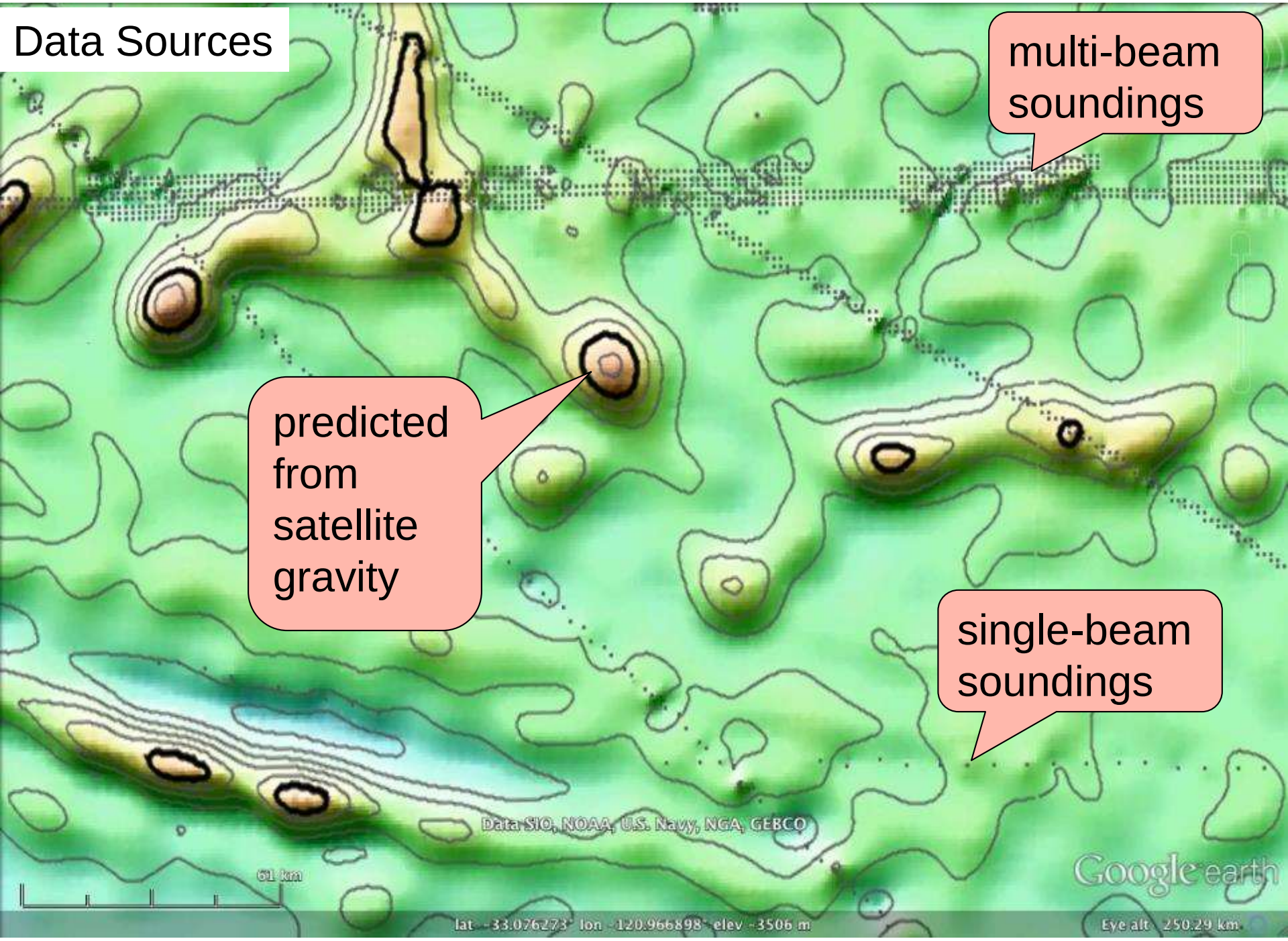


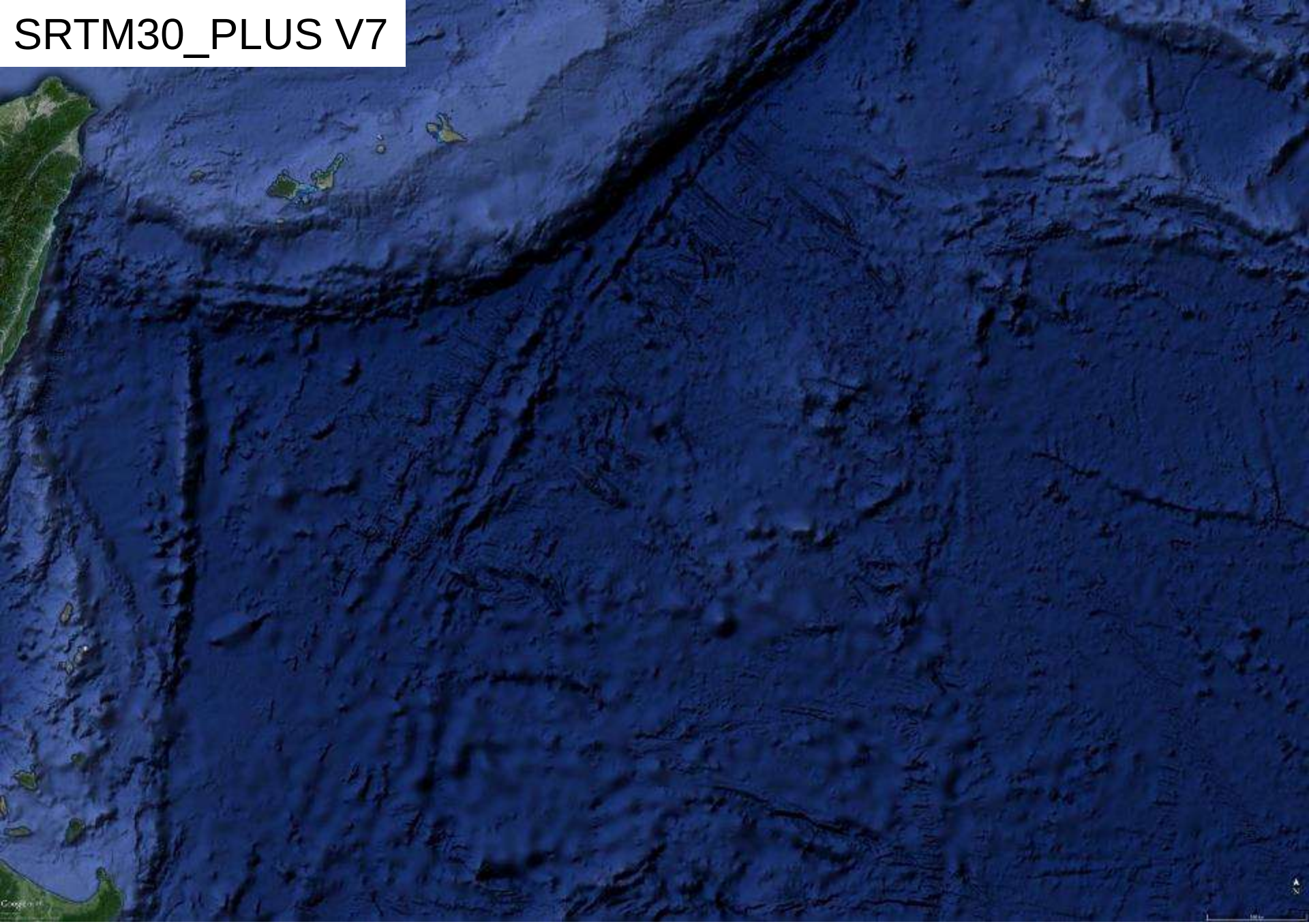
SRTM30_PLUS V7

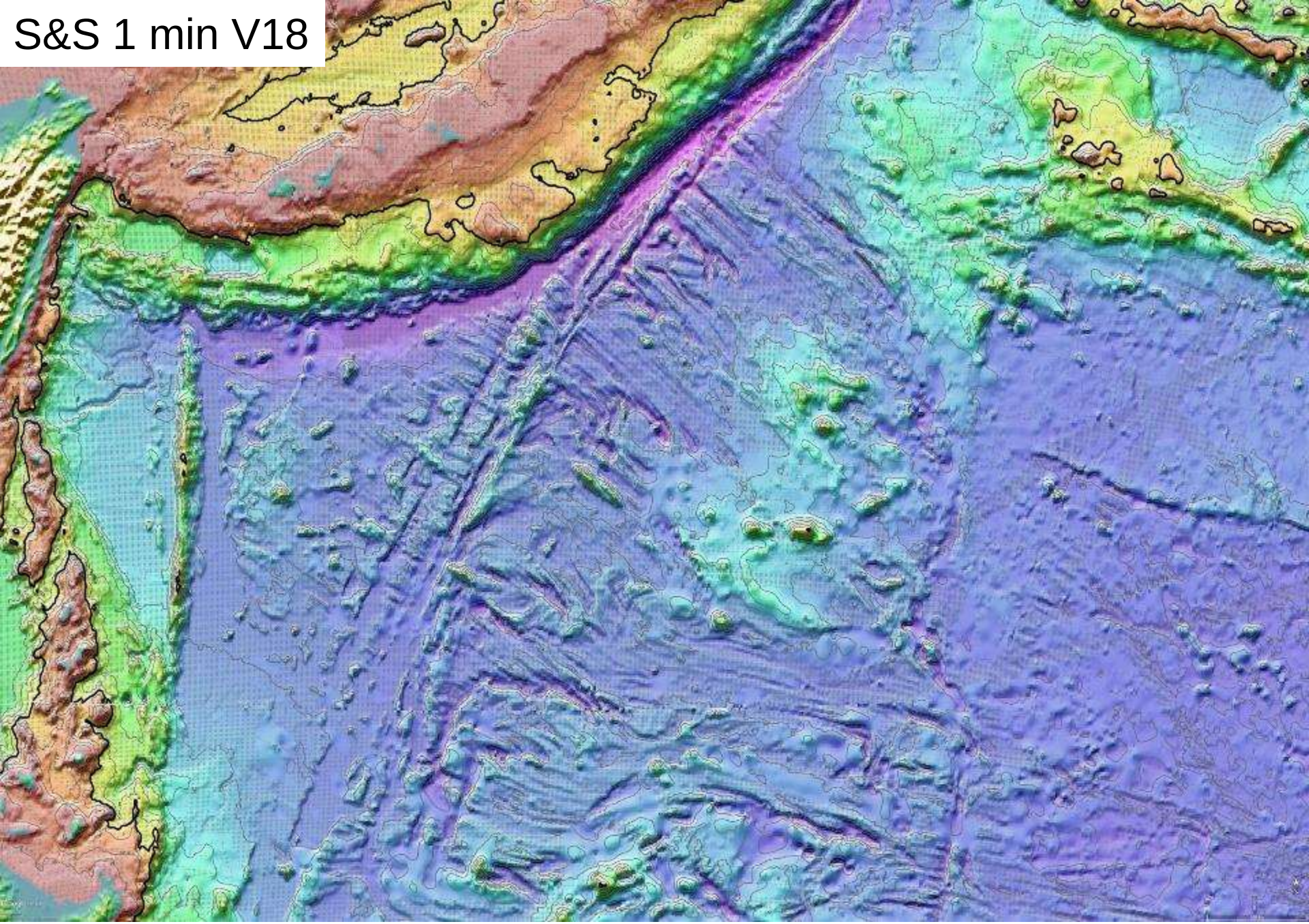


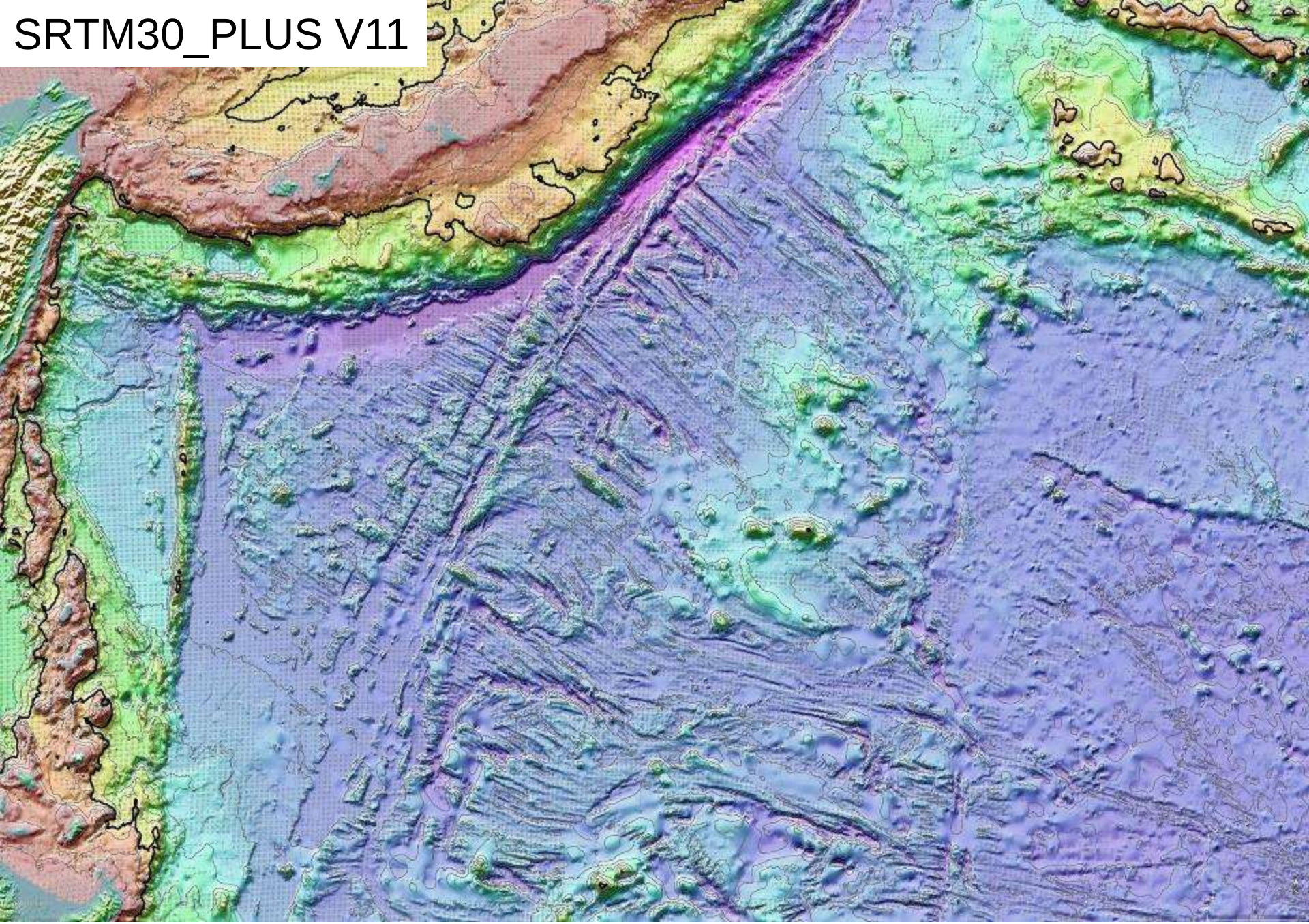
SRTM30_PLUS & sounding coverage

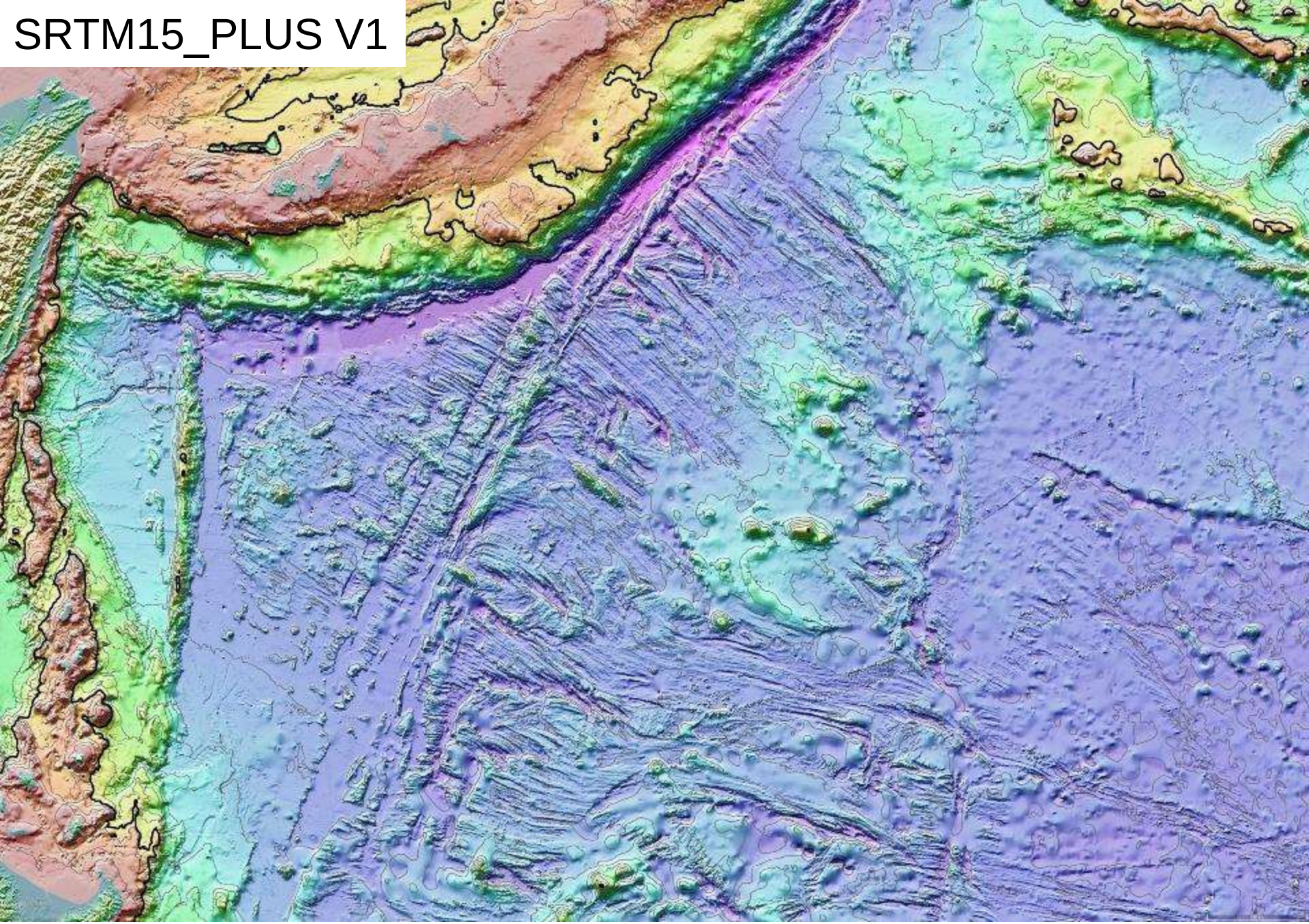


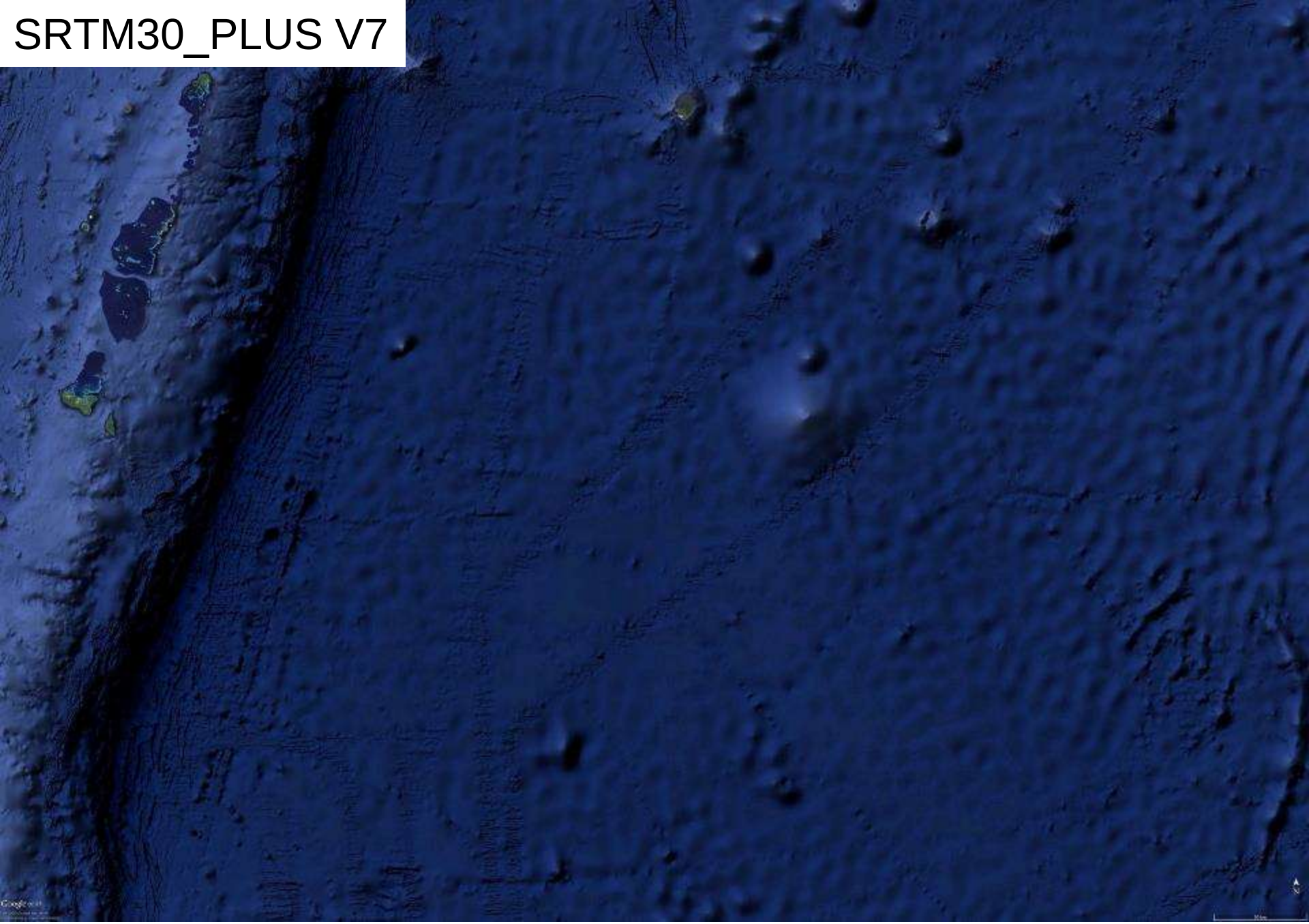

Data Sources
multi-beam soundings
predicted from satellite gravity
single-beam soundings
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
61 km
Google earth
lat -33.076273° lon -120.966898° elev -3506 m
Eye alt 250.29 km


SRTM30_PLUS V7


S&S 1 min V18


SRTM30_PLUS V11


SRTM15_PLUS V1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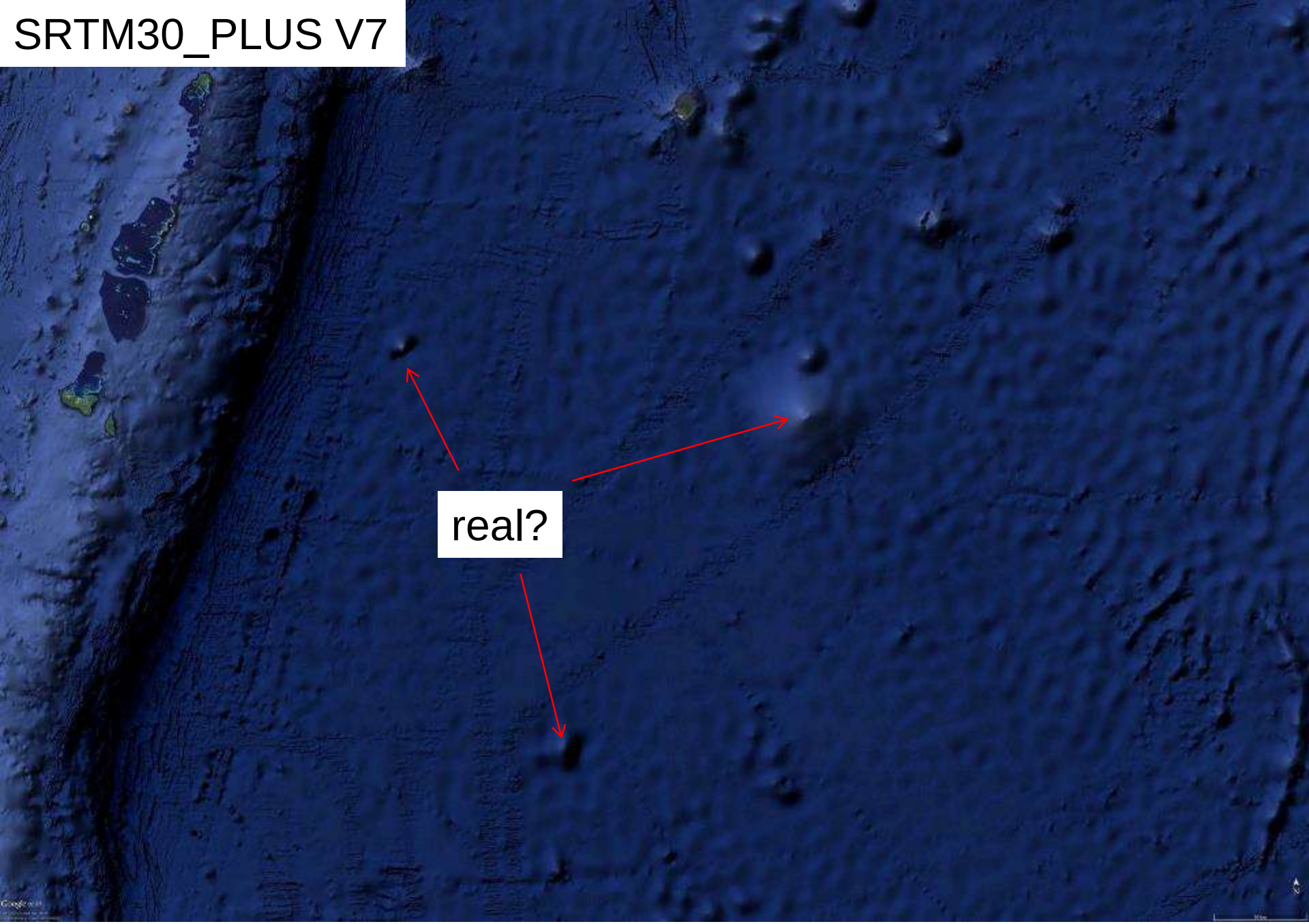
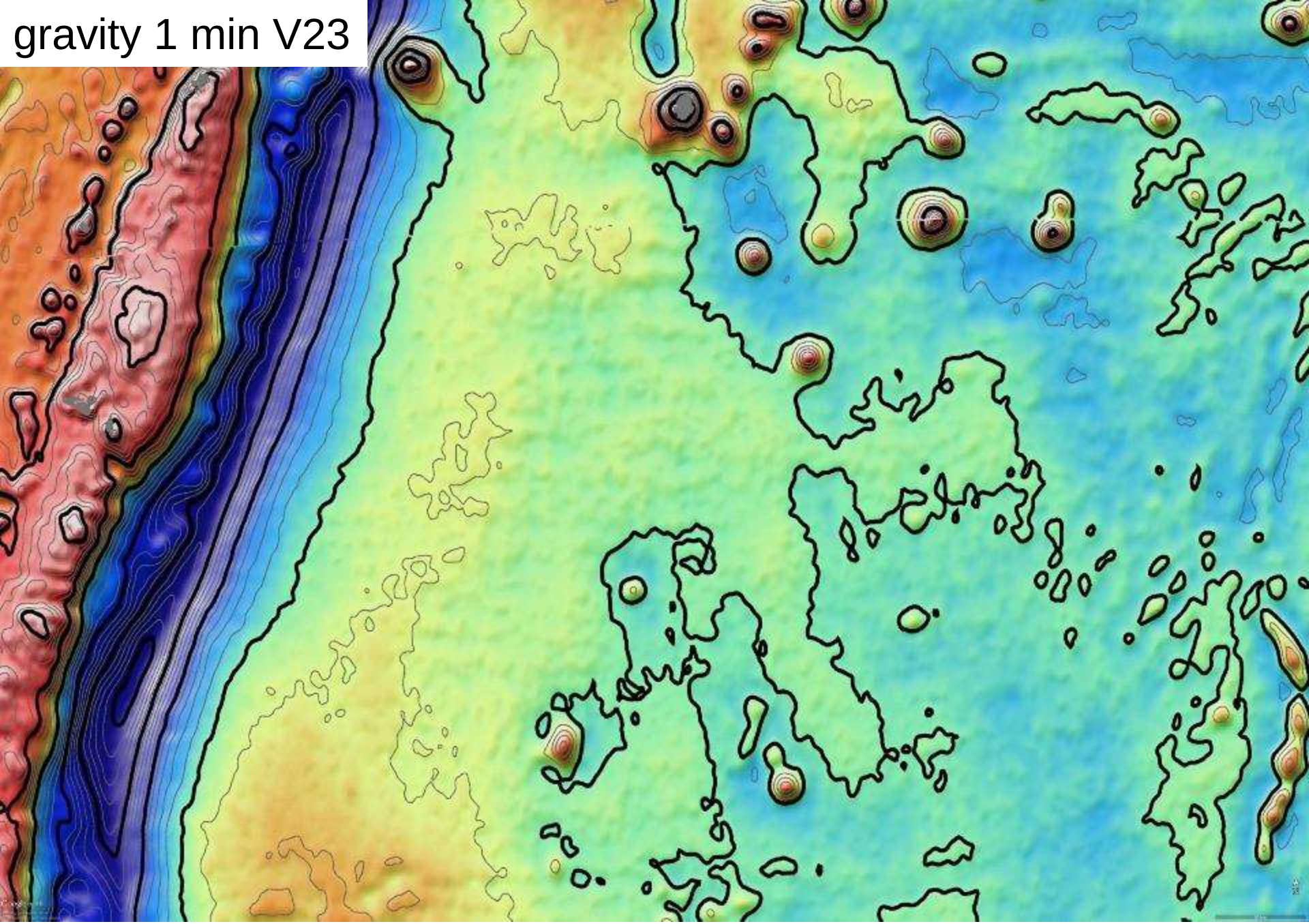
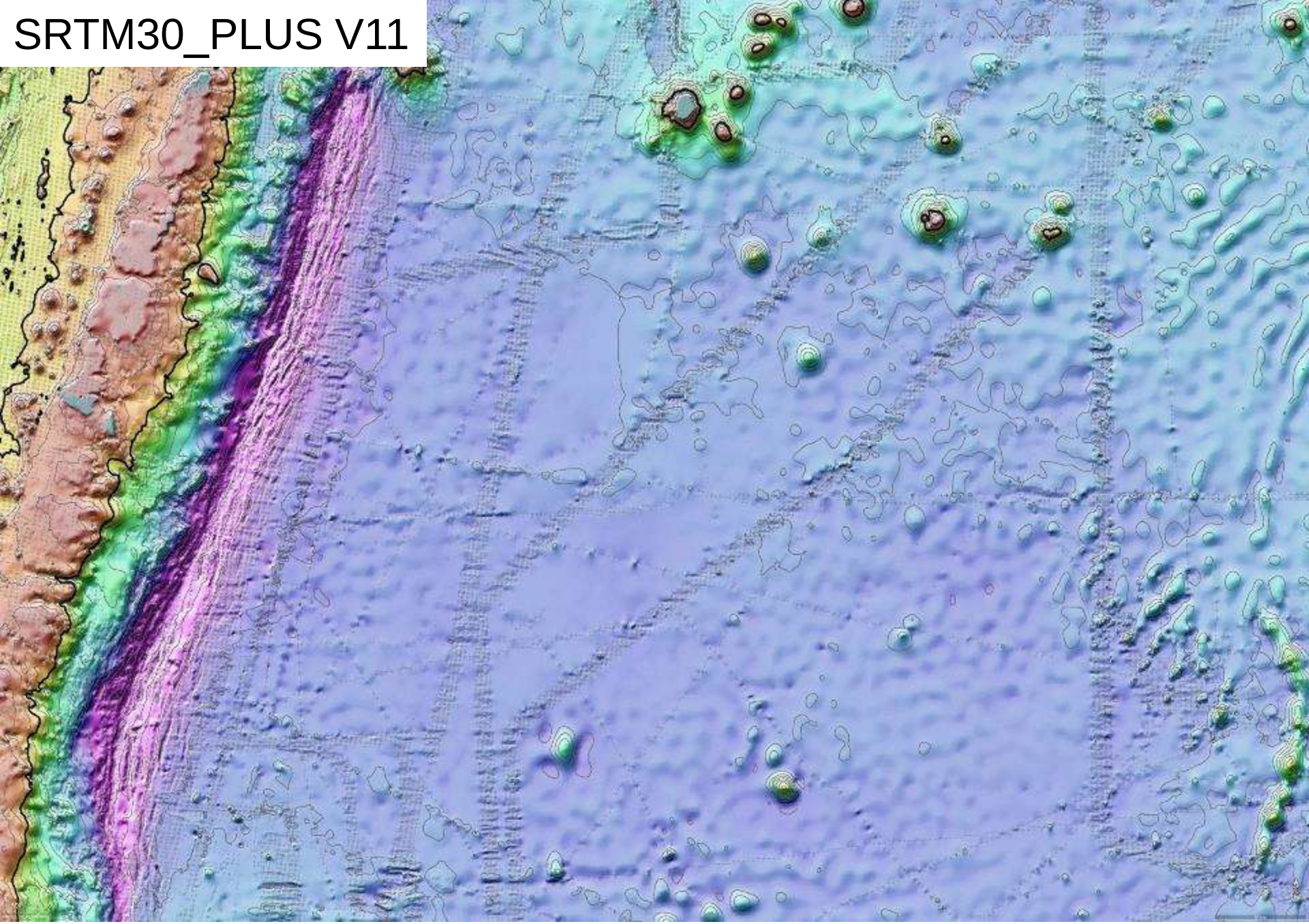

SRTM30_PLUS V7
real?


gravity 1 min V23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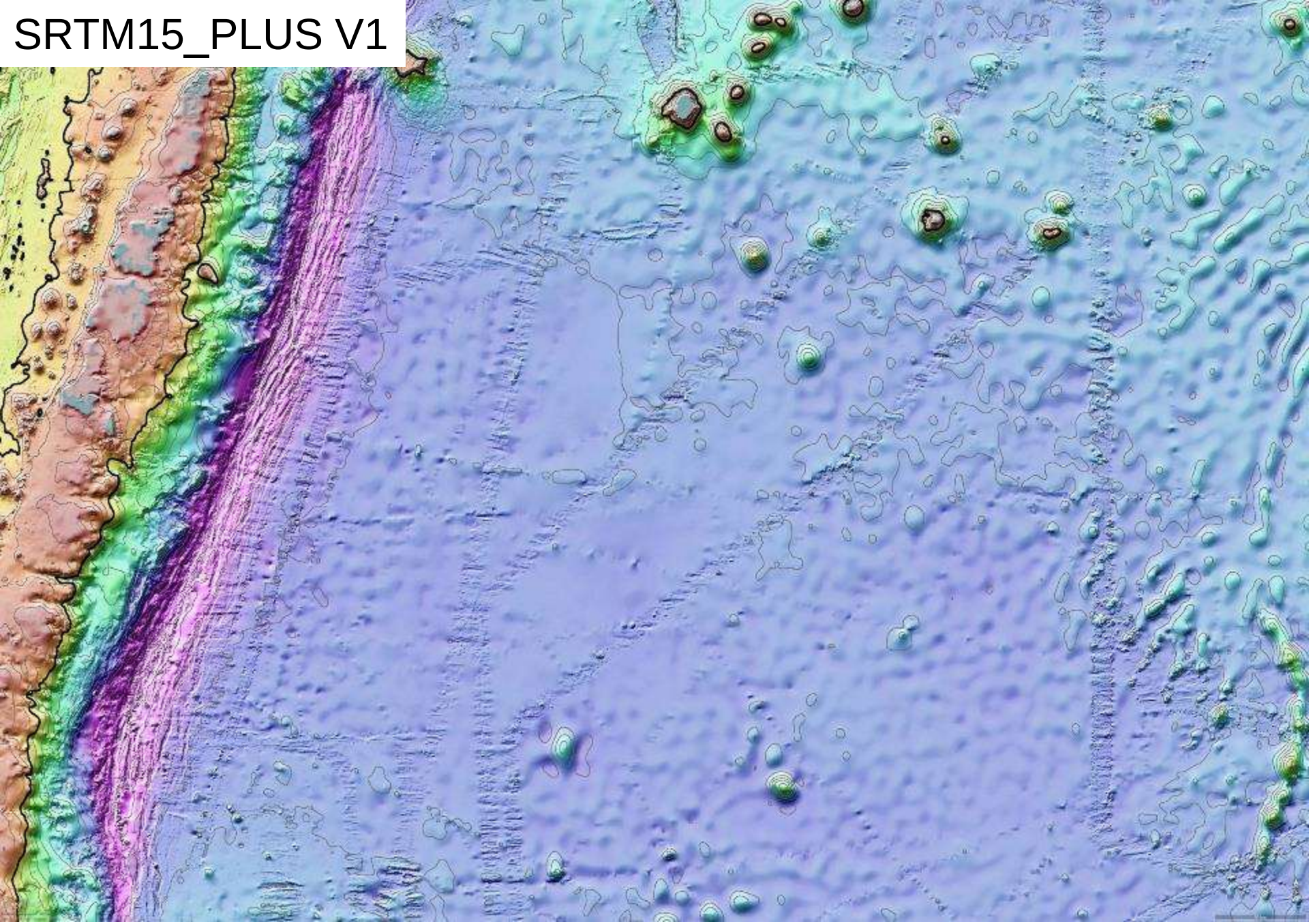
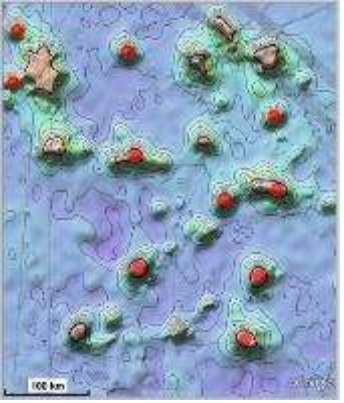

SRTM15_PLUS V1



GEBCO Data Store & SRTM15_PLUS

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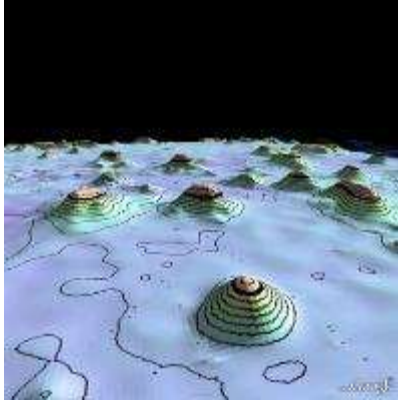
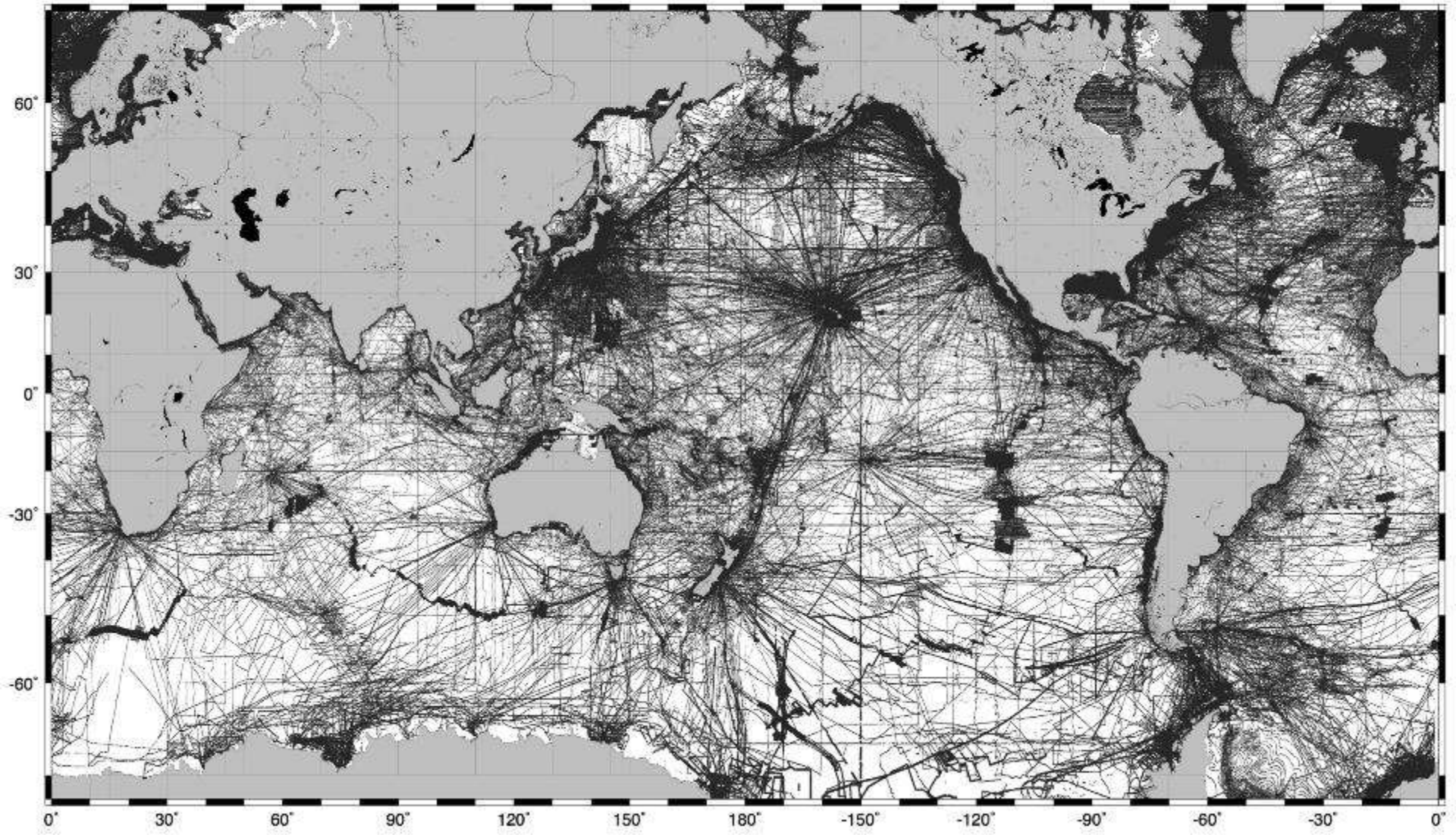


- Needs for improved bathymetry
- Three resolutions: 60 sec, 30 sec, 15 sec
- **Data Store Contributions**
- Editing for 15 sec
- How can we do better?

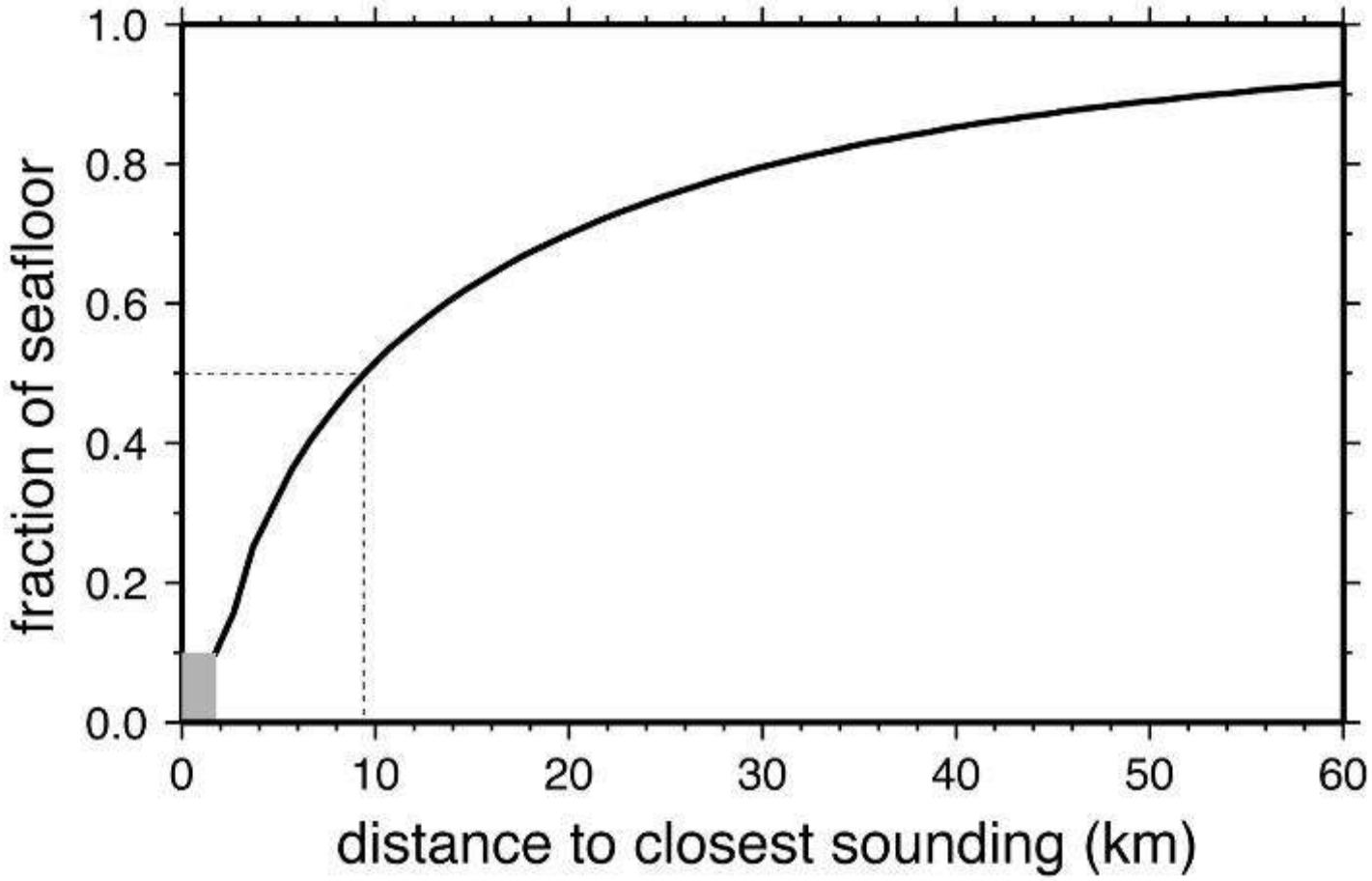
Funding: Google, NSF, ONR, ConocoPhillips

Soundings used in SRTM15/30_PLUS

multibeam, singlebeam, grids, . . .

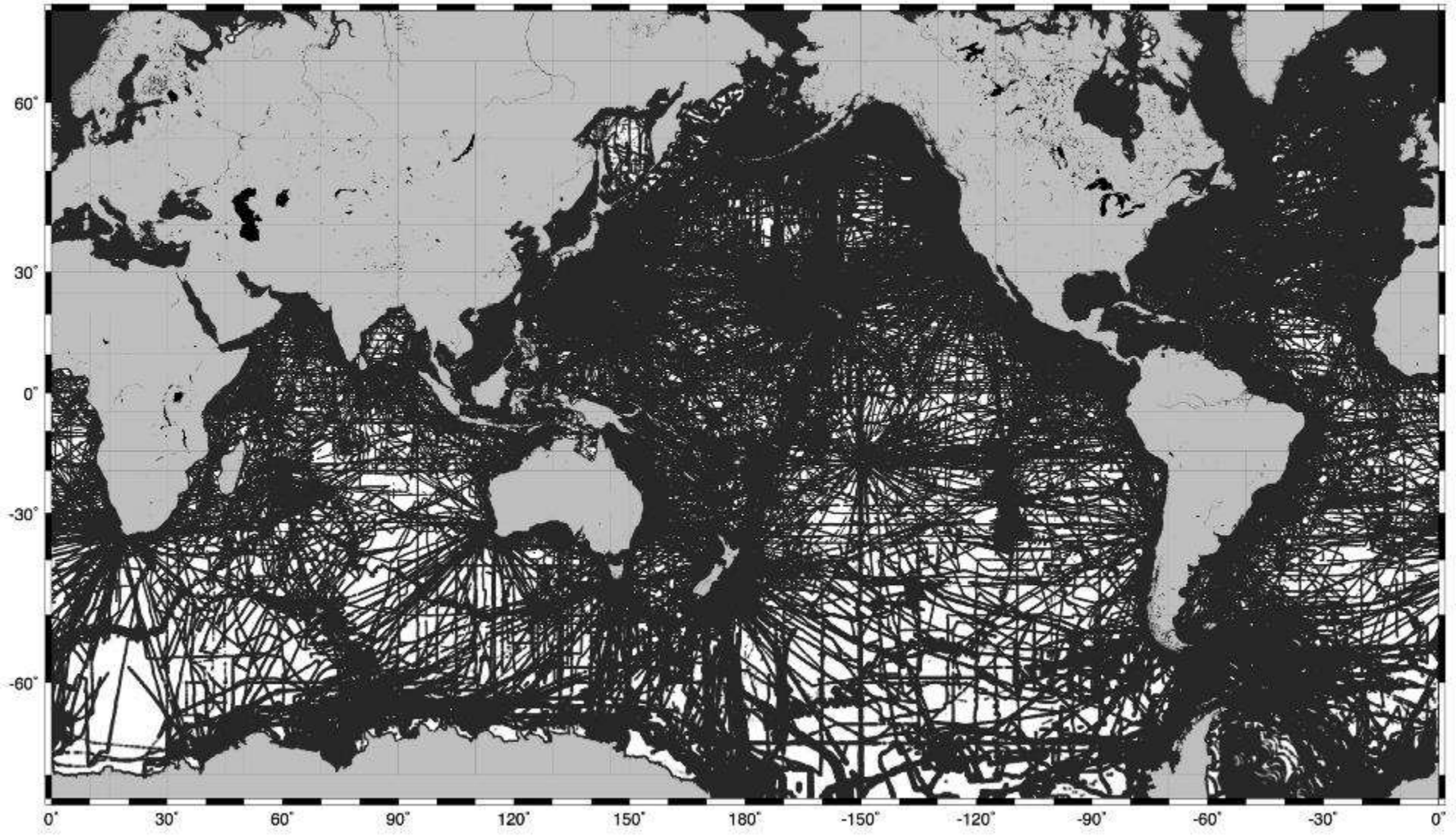


1/2 of global seafloor bathymetry not resolved at 10 km resolution



[Smith and Marks, 2009]

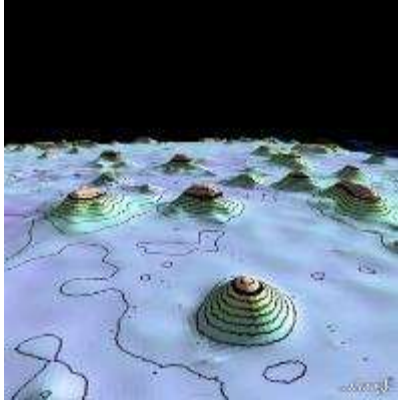
areas of seafloor more than 10 km from a sounding



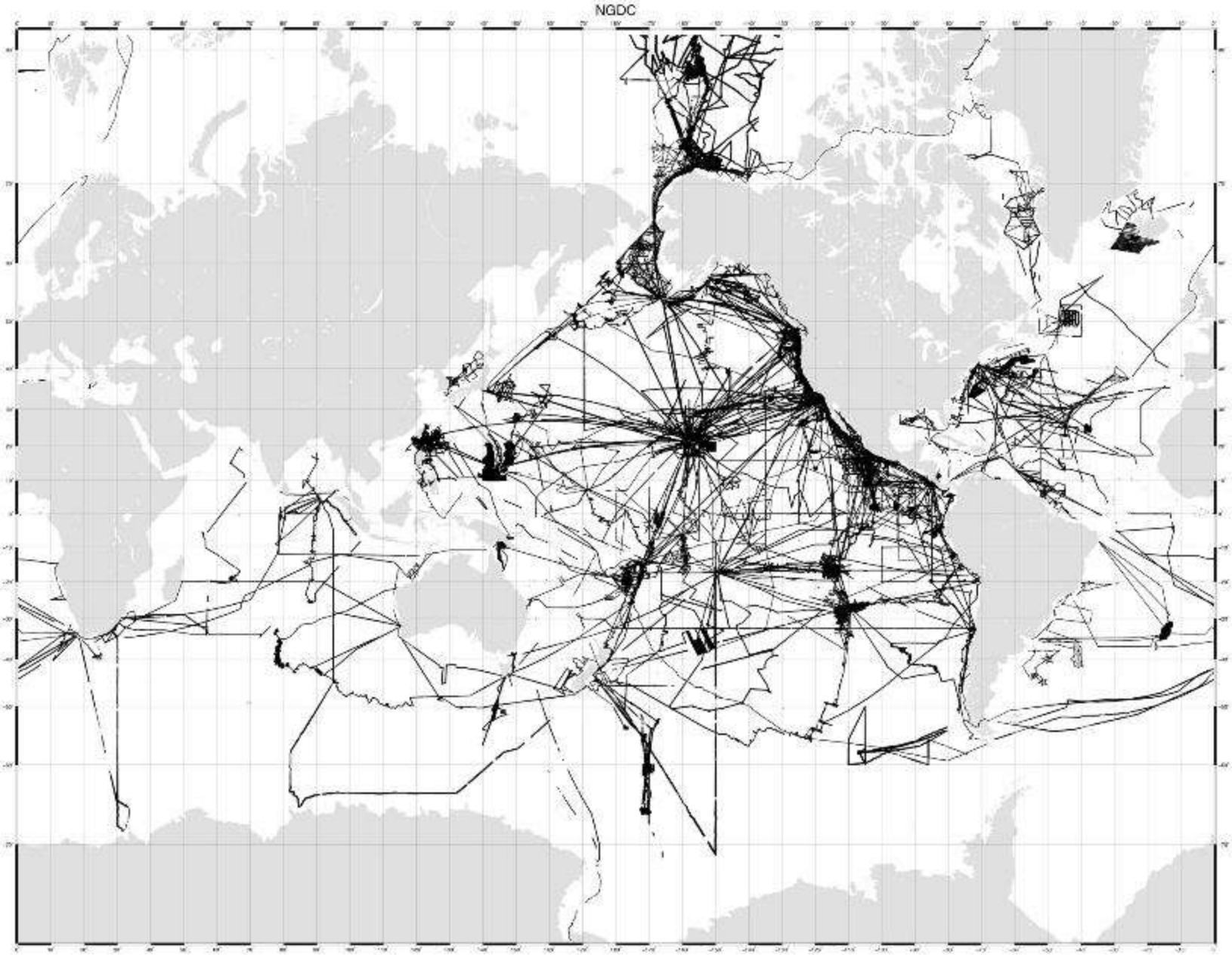
Data available at GEBCO Data Store

- Soundings blockmedian at 500 m spatial resolution
- Common cm-format – 9317 files – 439 million soundings
- Bad soundings flagged
- Source Identification Number (SID) used to link soundings back to original source

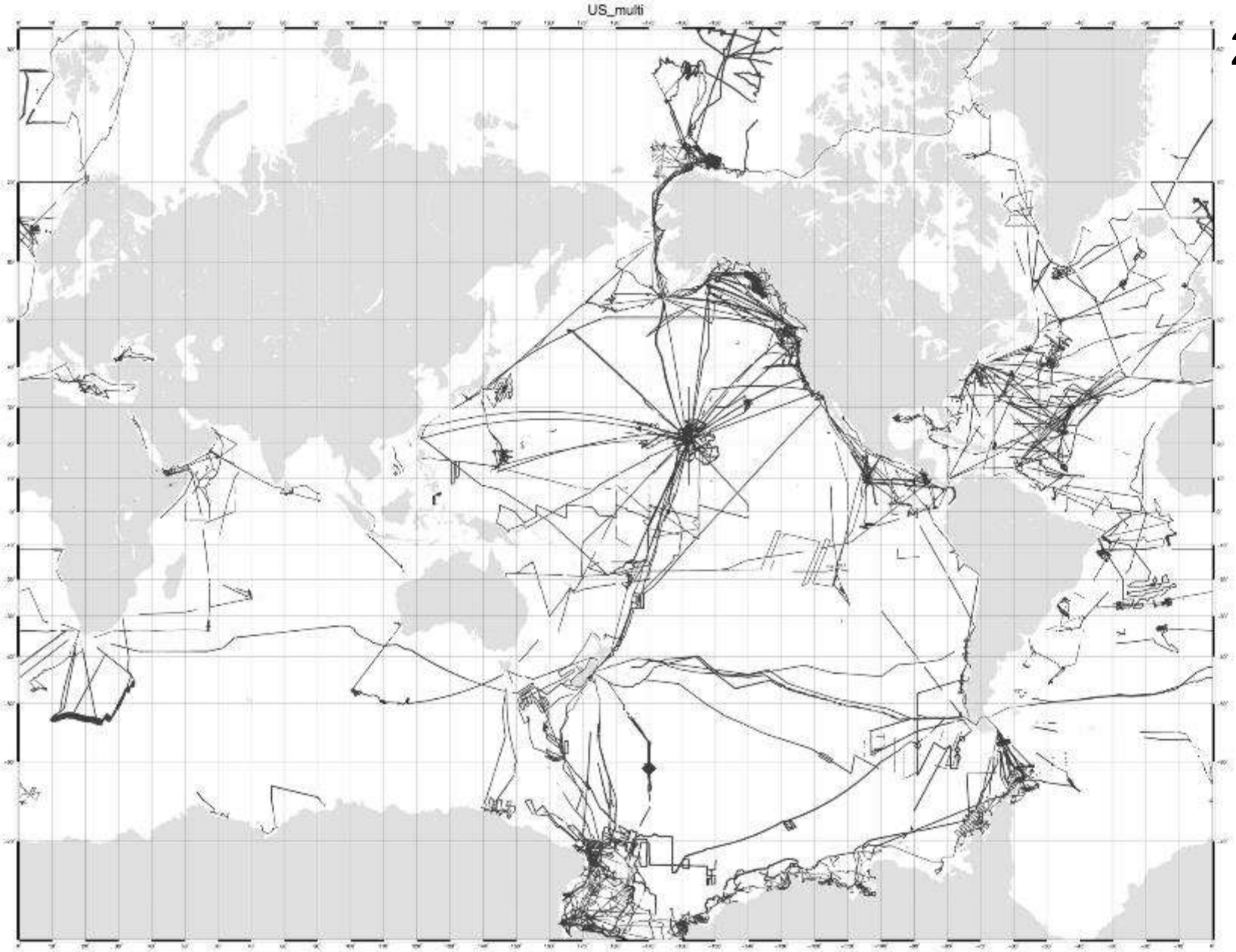
source	# points (500 m)	% flagged	% seafloor @ 1 km
NGDC_multi	127901083	4.75	5.134
NOAA_geodas	40897565	11.06	2.506
US_multi	51187020	5.32	2.219
JAMSTEC_multi	79103040	0.62	2.04
SIO_various	40754645	13.93	1.325
IBCAO_various	18302390	0.03	0.773
GEBCO_various	8950614	0.17	0.523
AGSO_grid	12875795	2.62	0.503
DNC_points	5878651	1.23	0.49
CCOM_grid	10023471	0.08	0.195
GEOMAR_grid	18138868	0.06	0.181
NGA_single	4415125	19.44	0.179
NOAA_grids	6748376	0.49	0.162
IFREMER_single	7653537	10.62	0.151
3DGBR_various	5523560	11.36	0.112
NAVO_multi	422089	0.06	0.009
total	**438,775,829**		**16.5 % in V11**



12% in V7



5.134%



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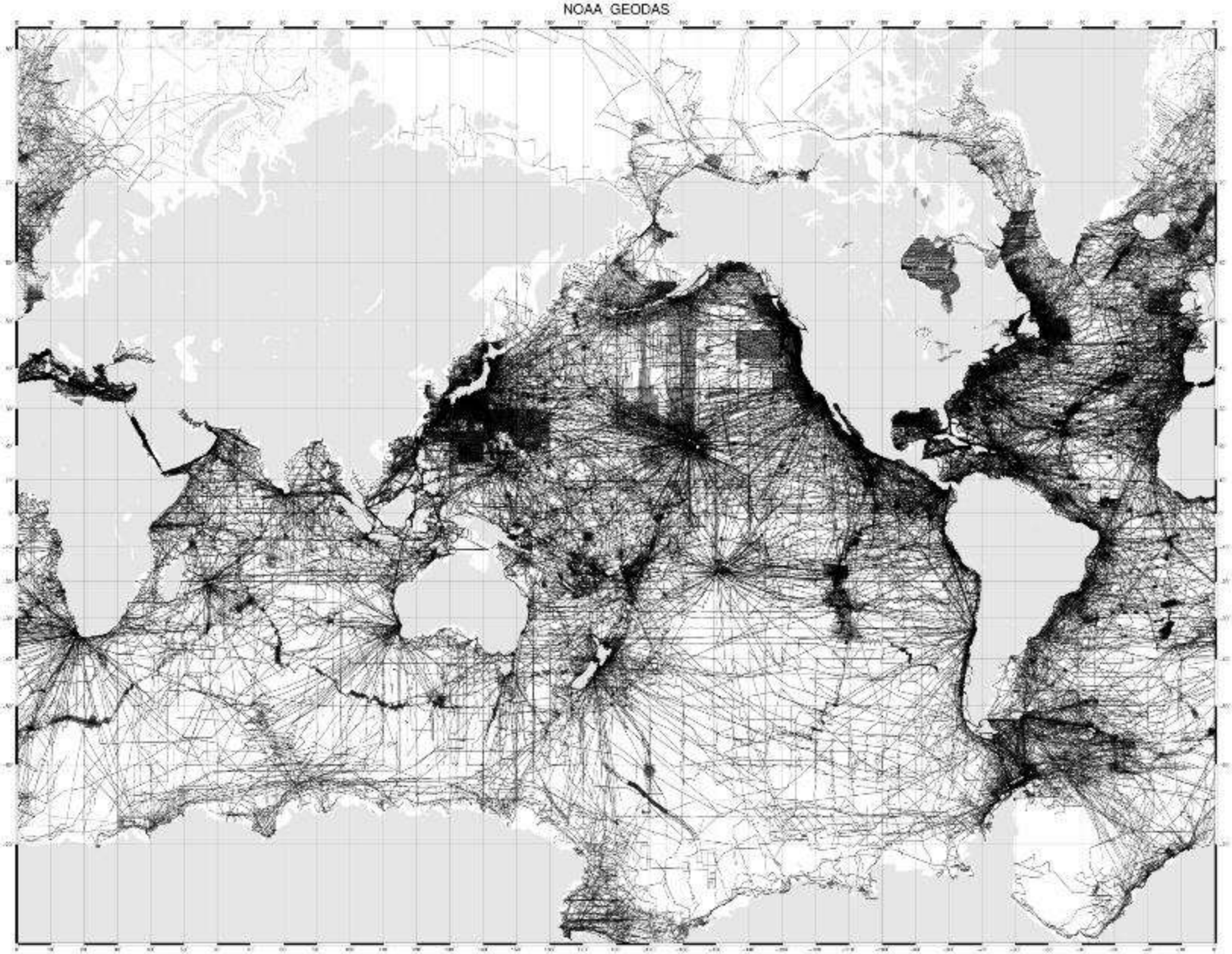

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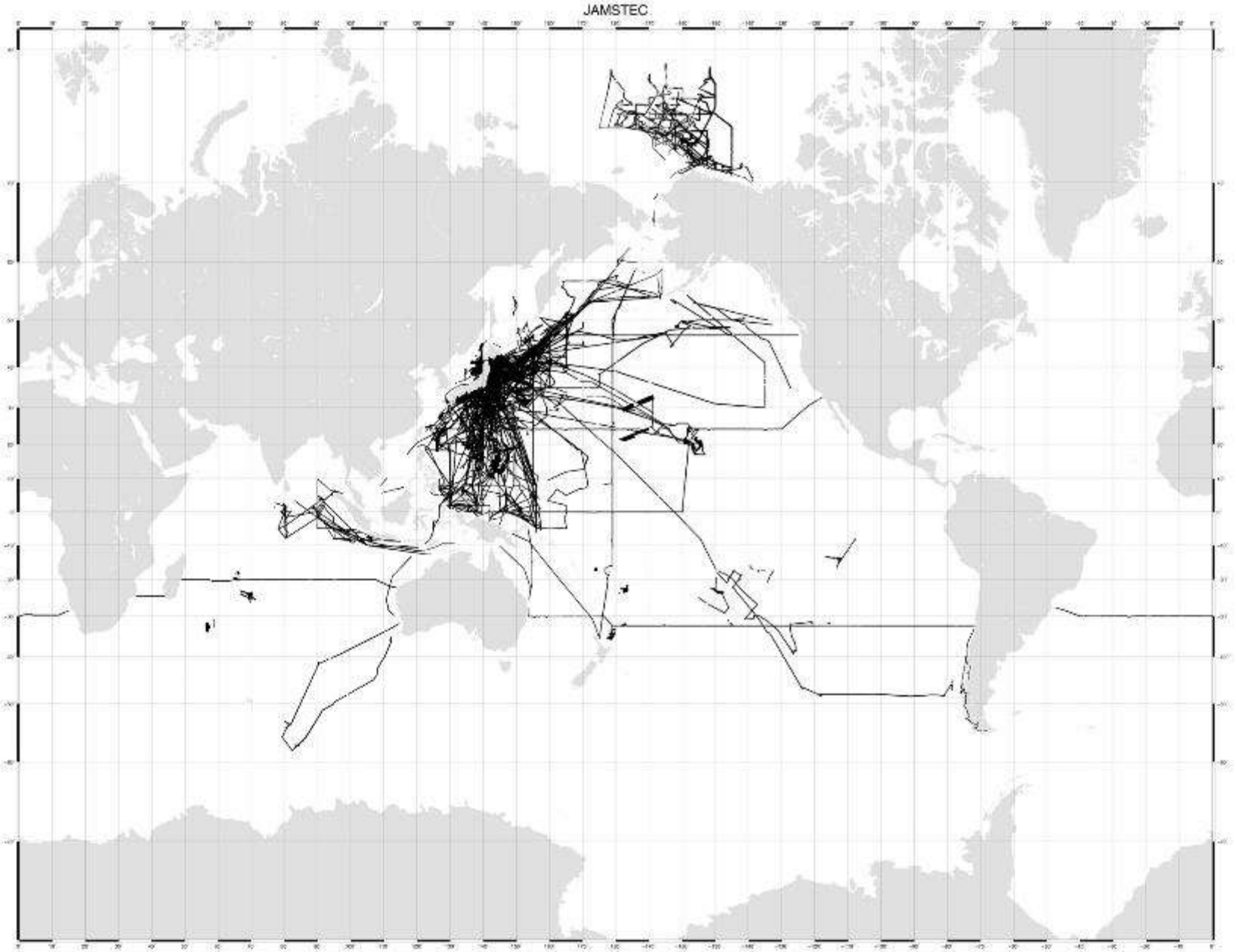

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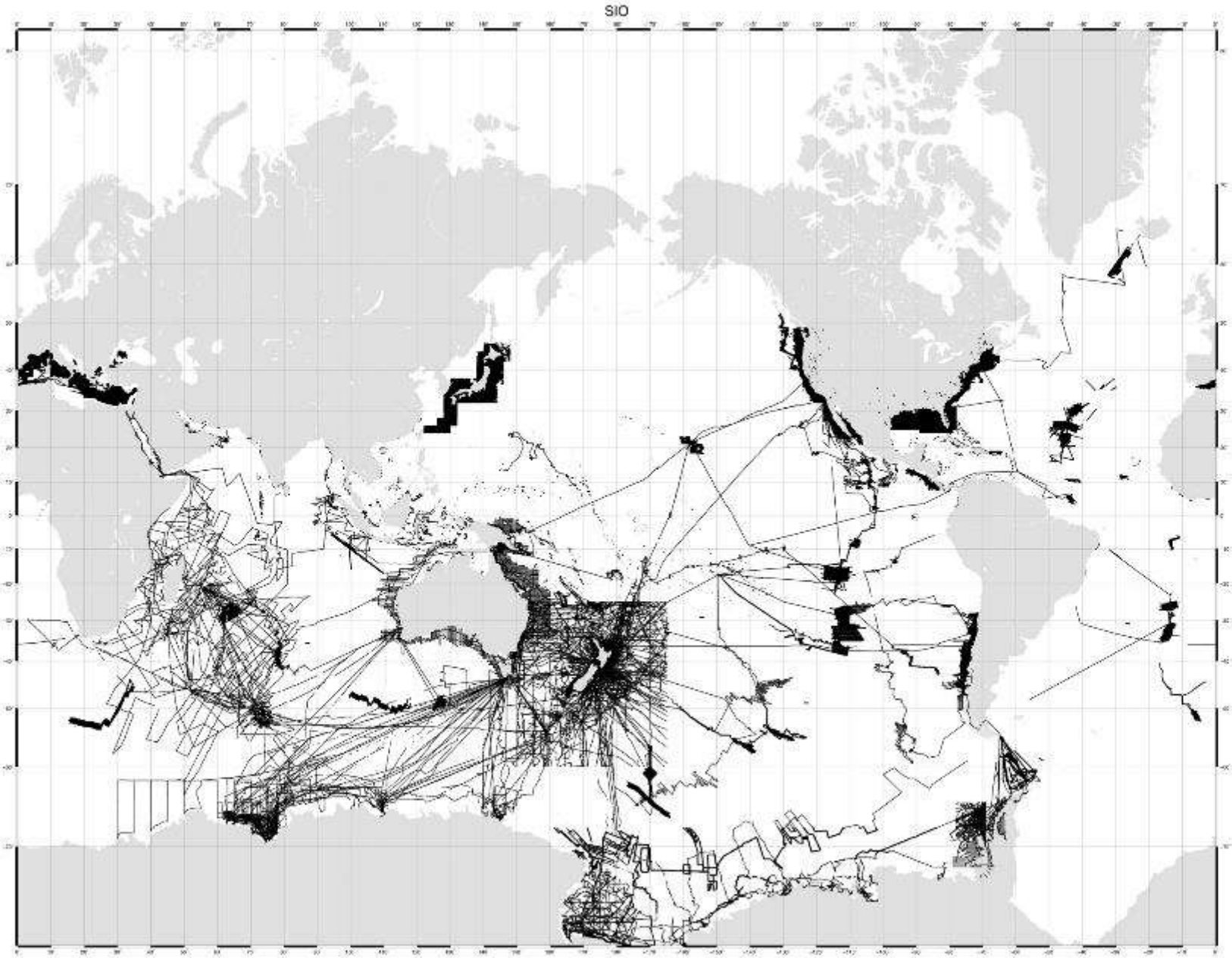

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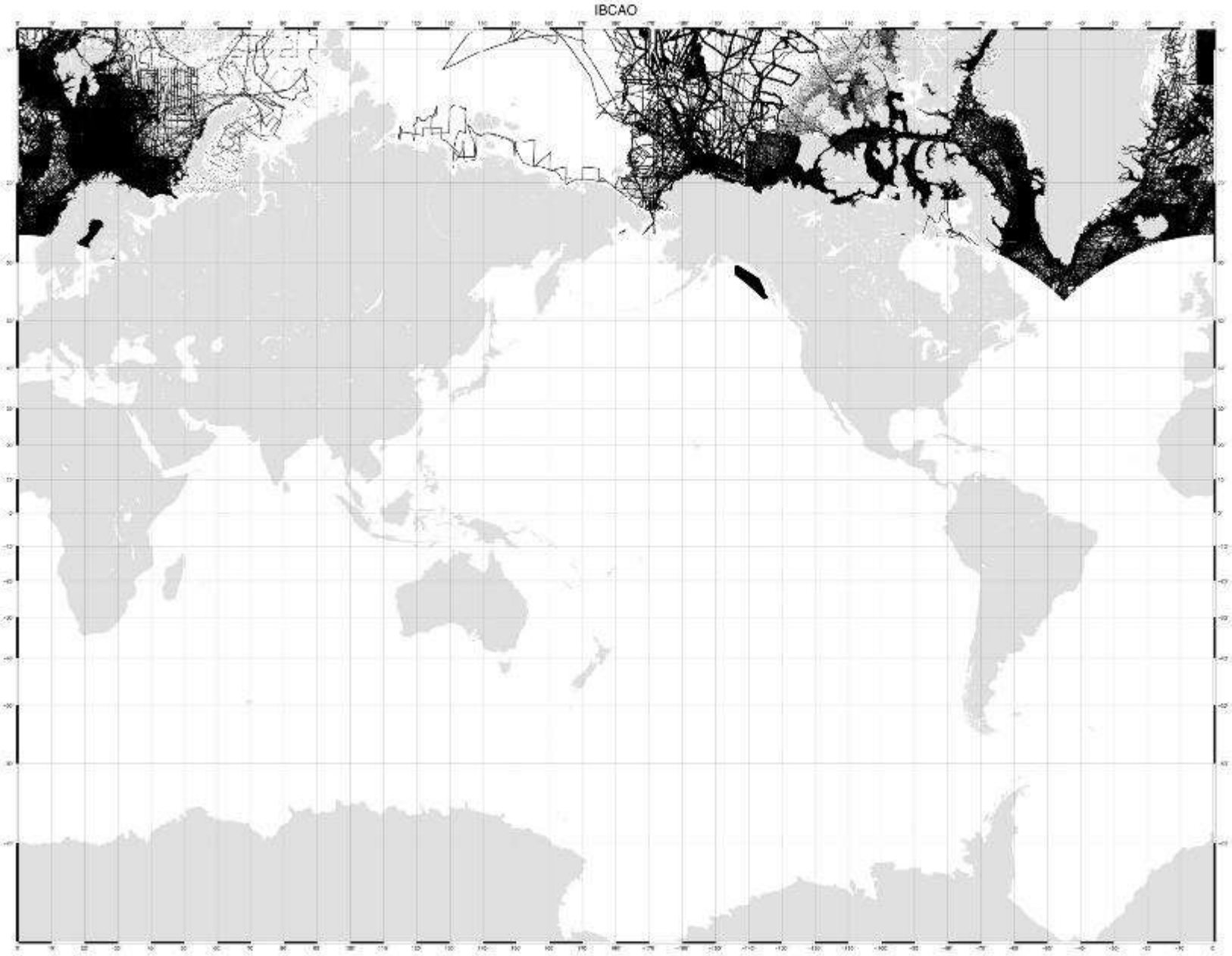

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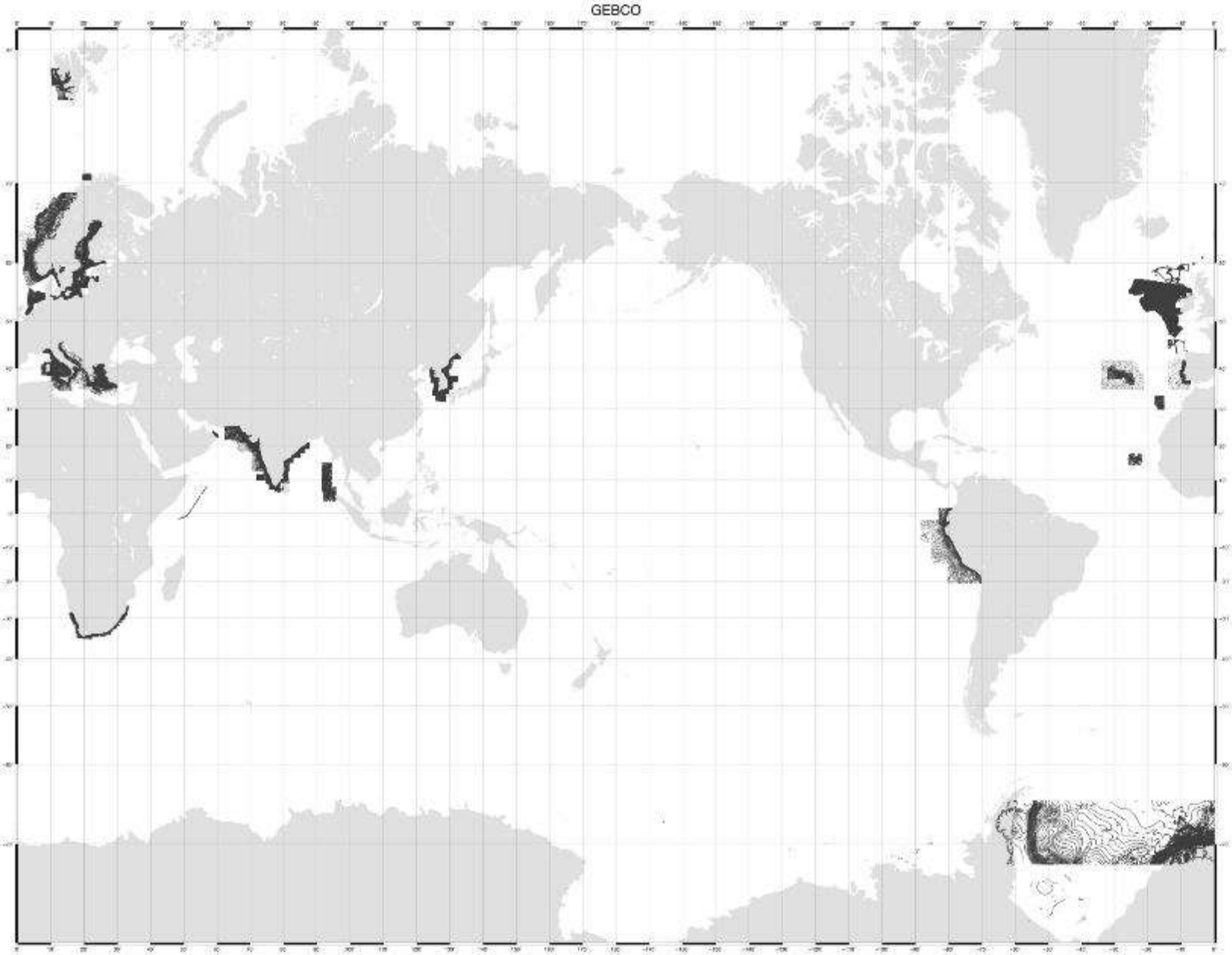

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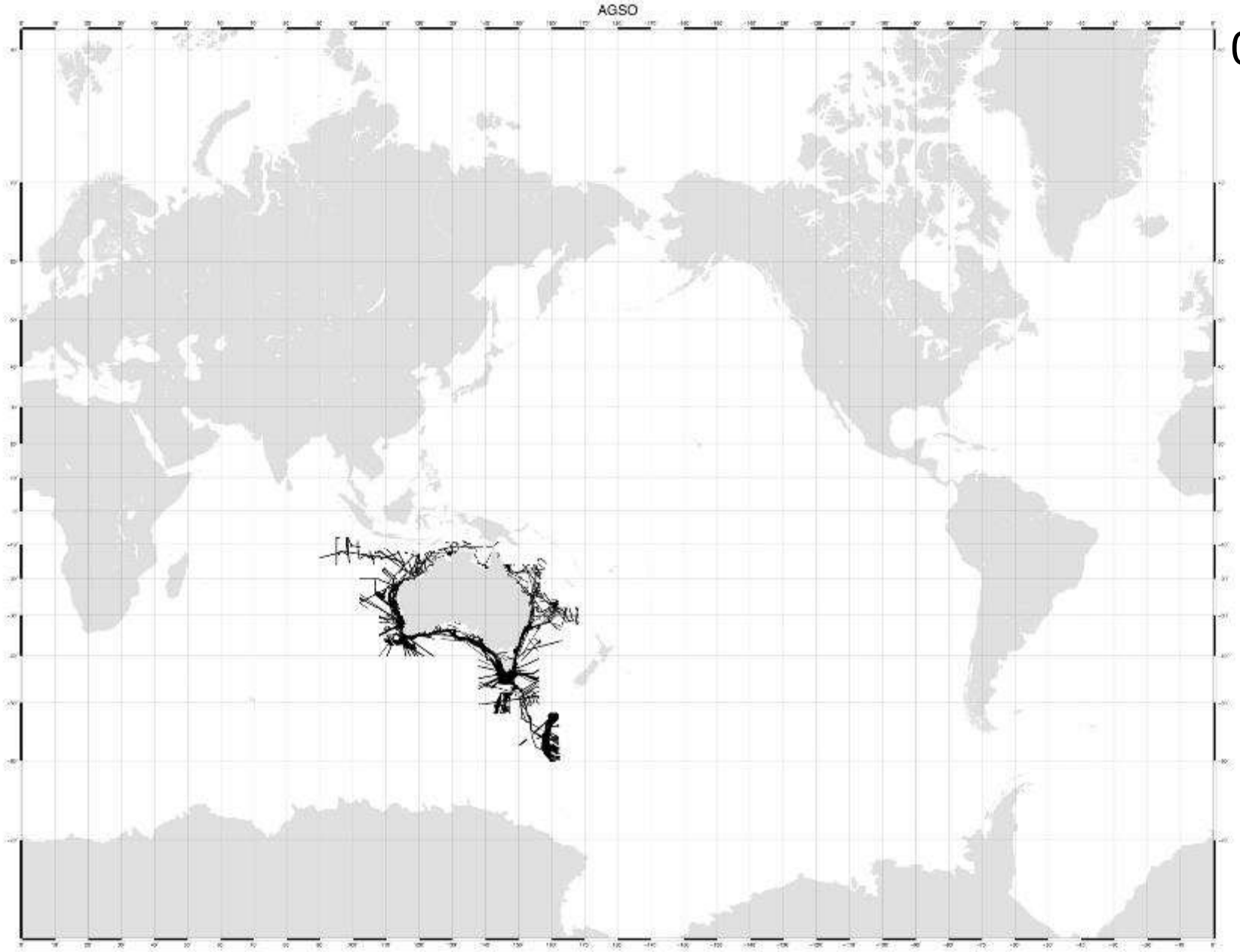

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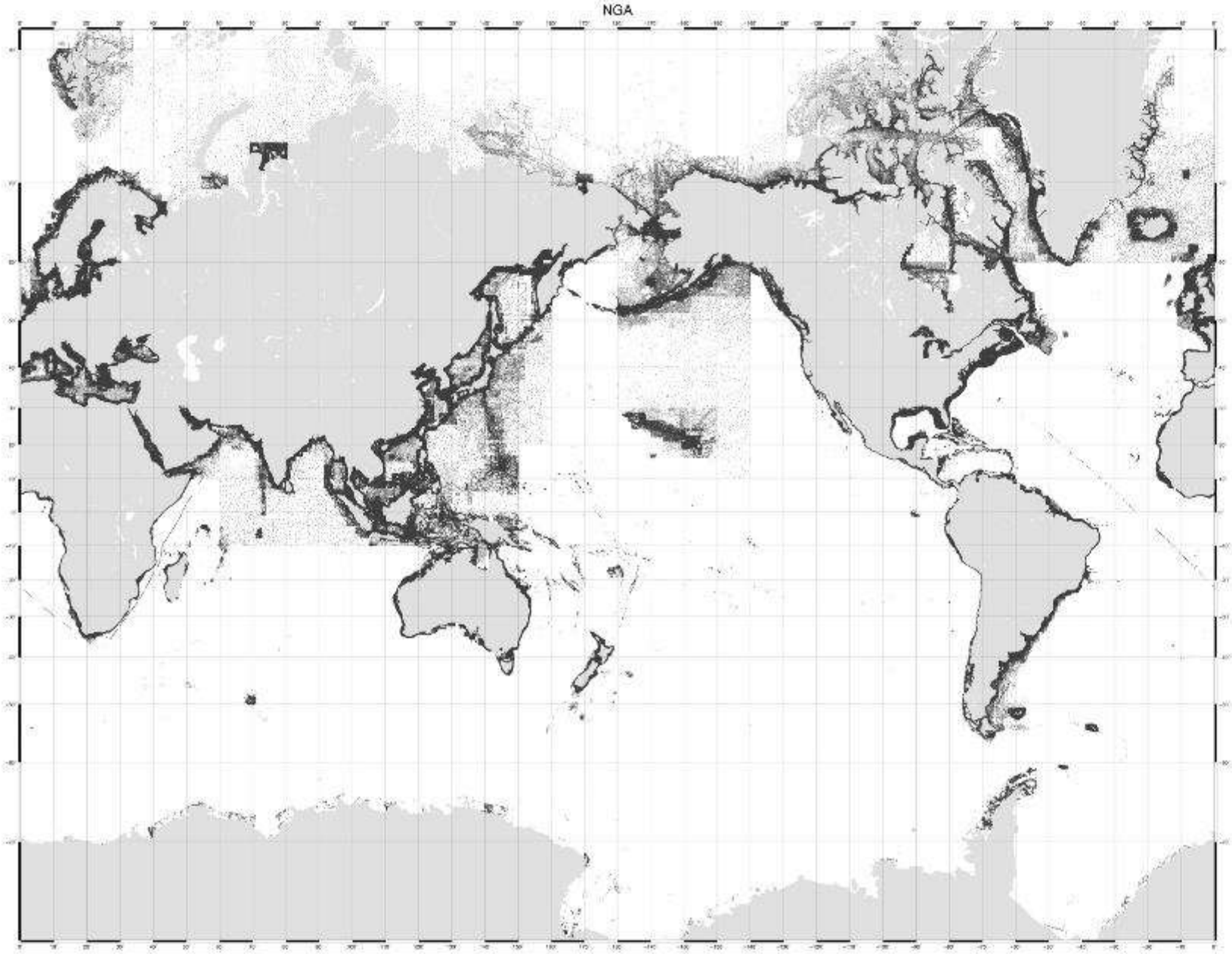

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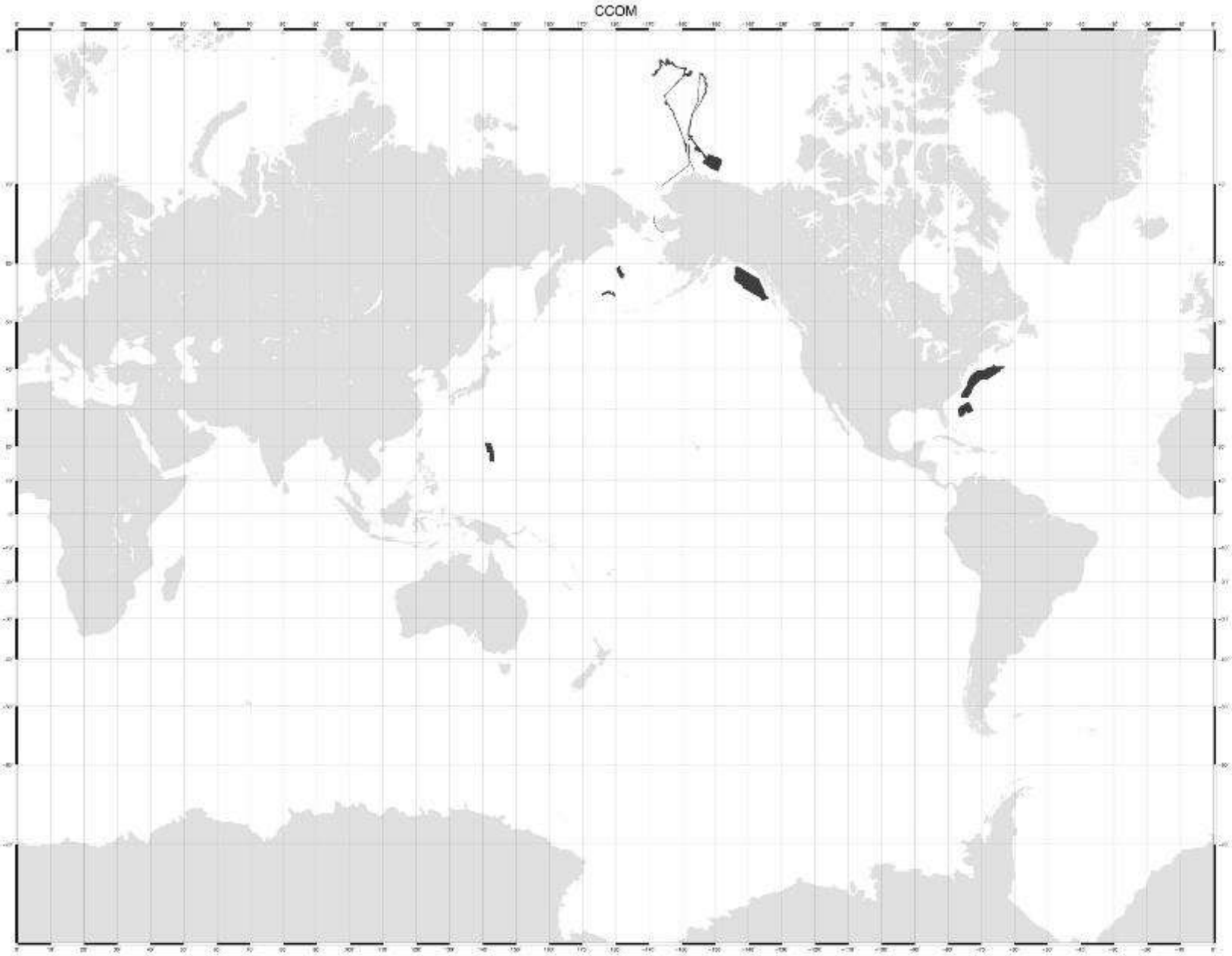

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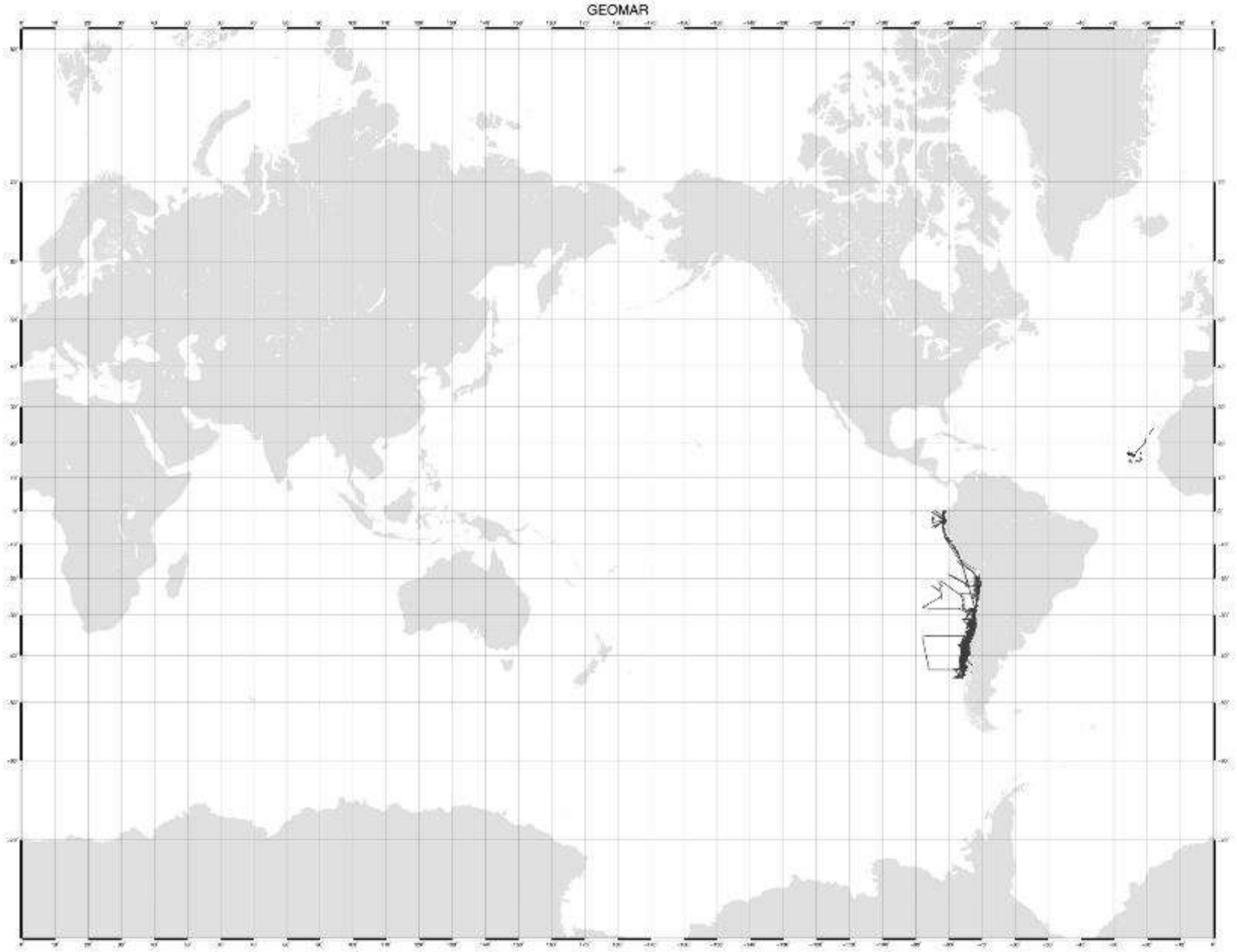

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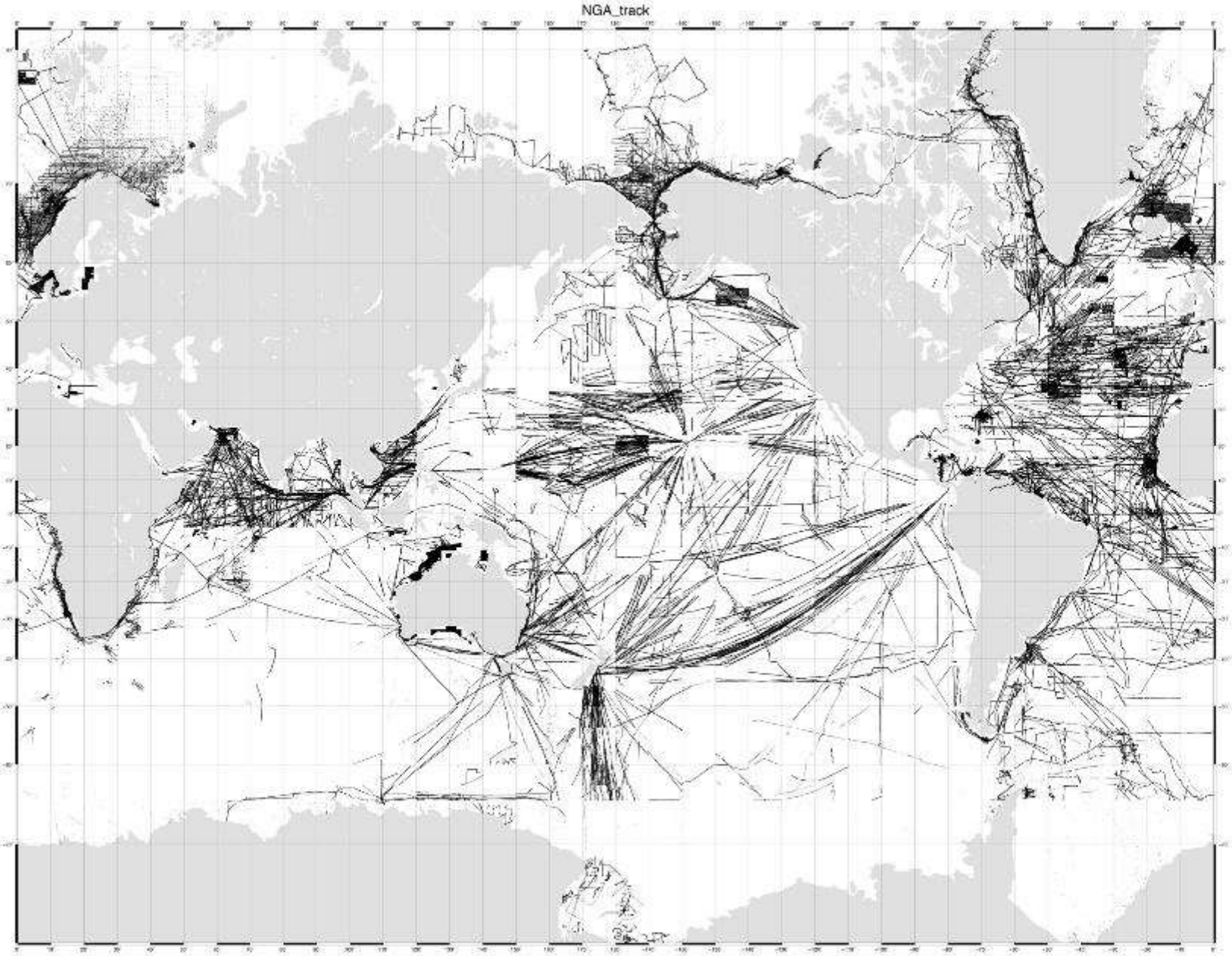

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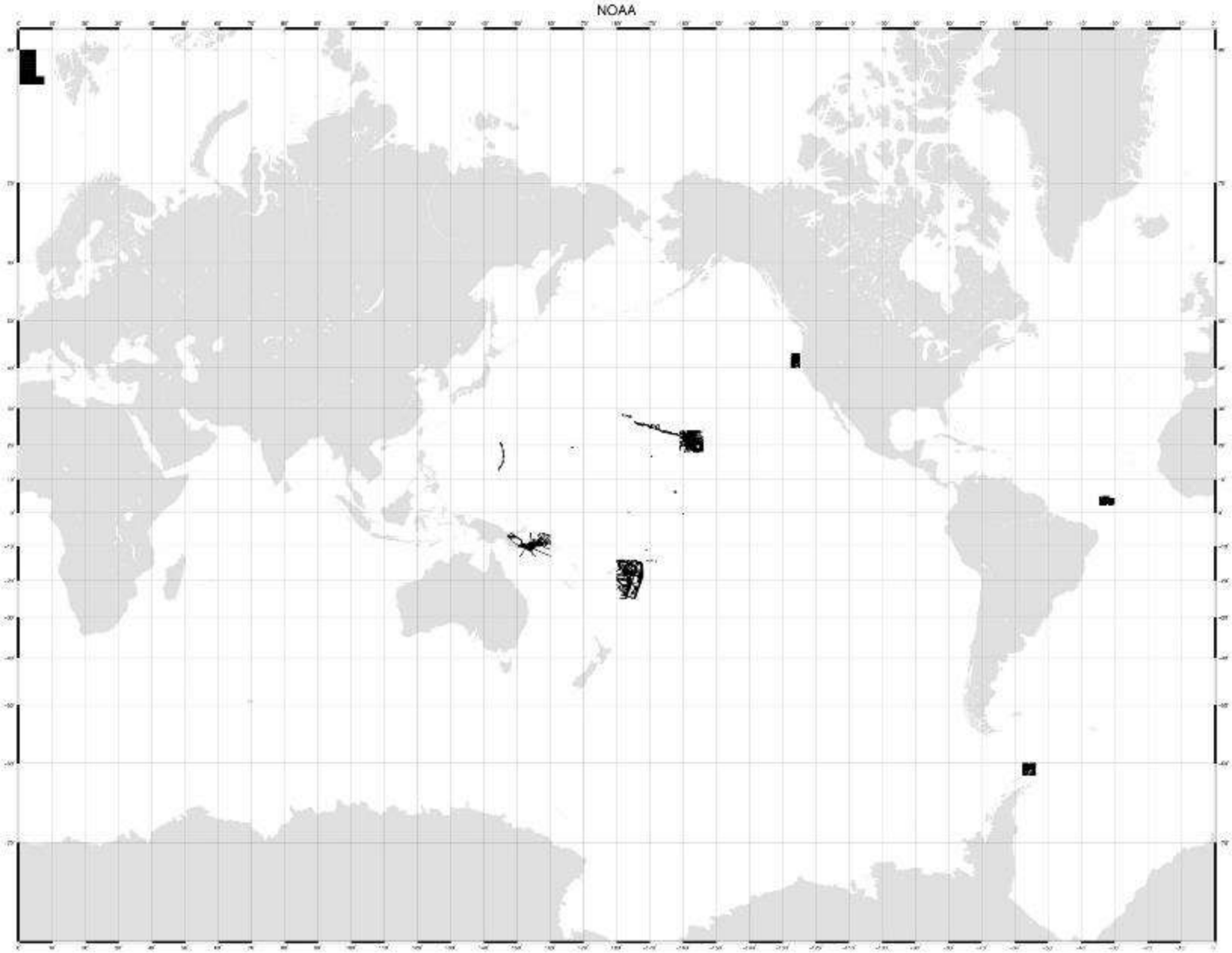

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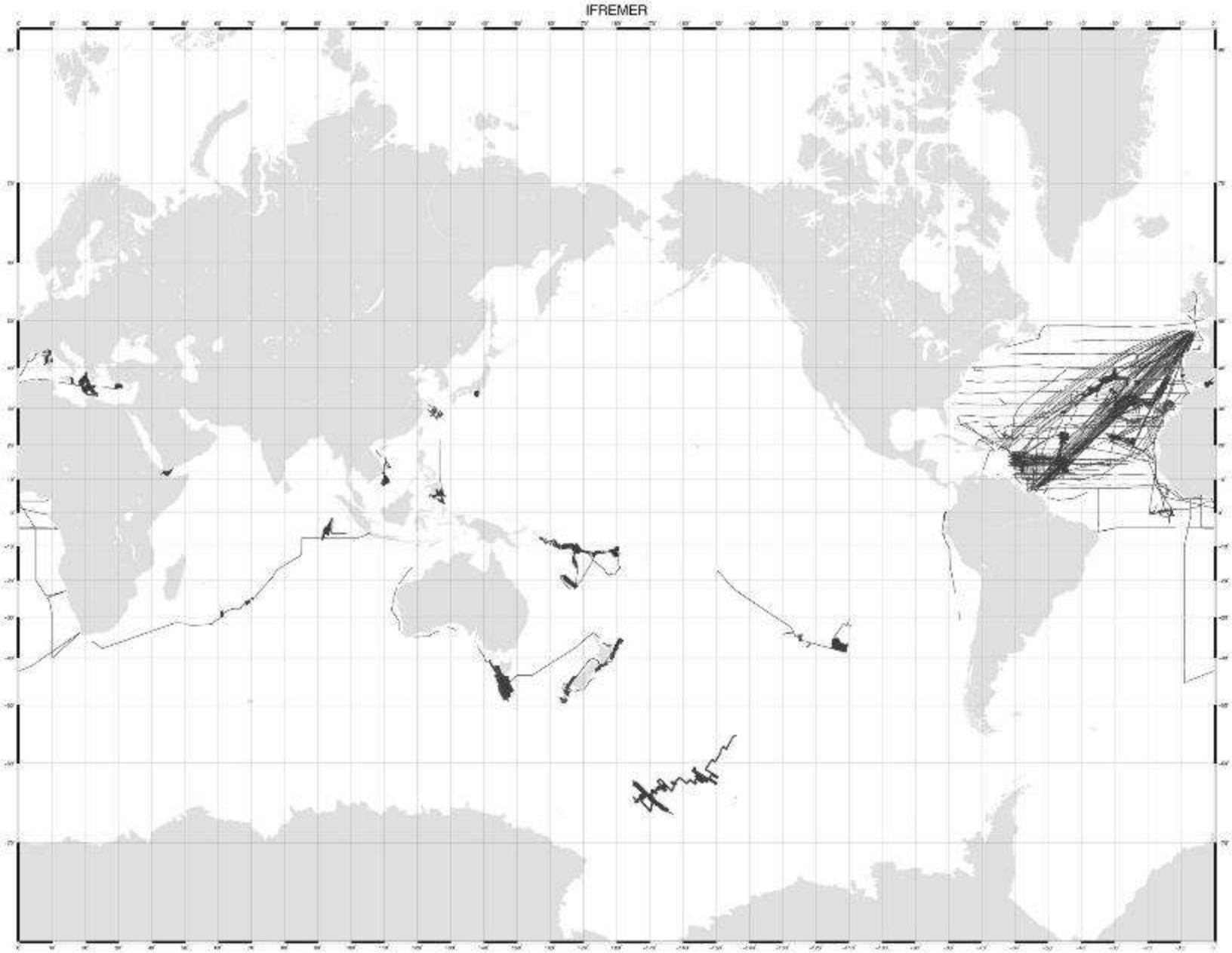

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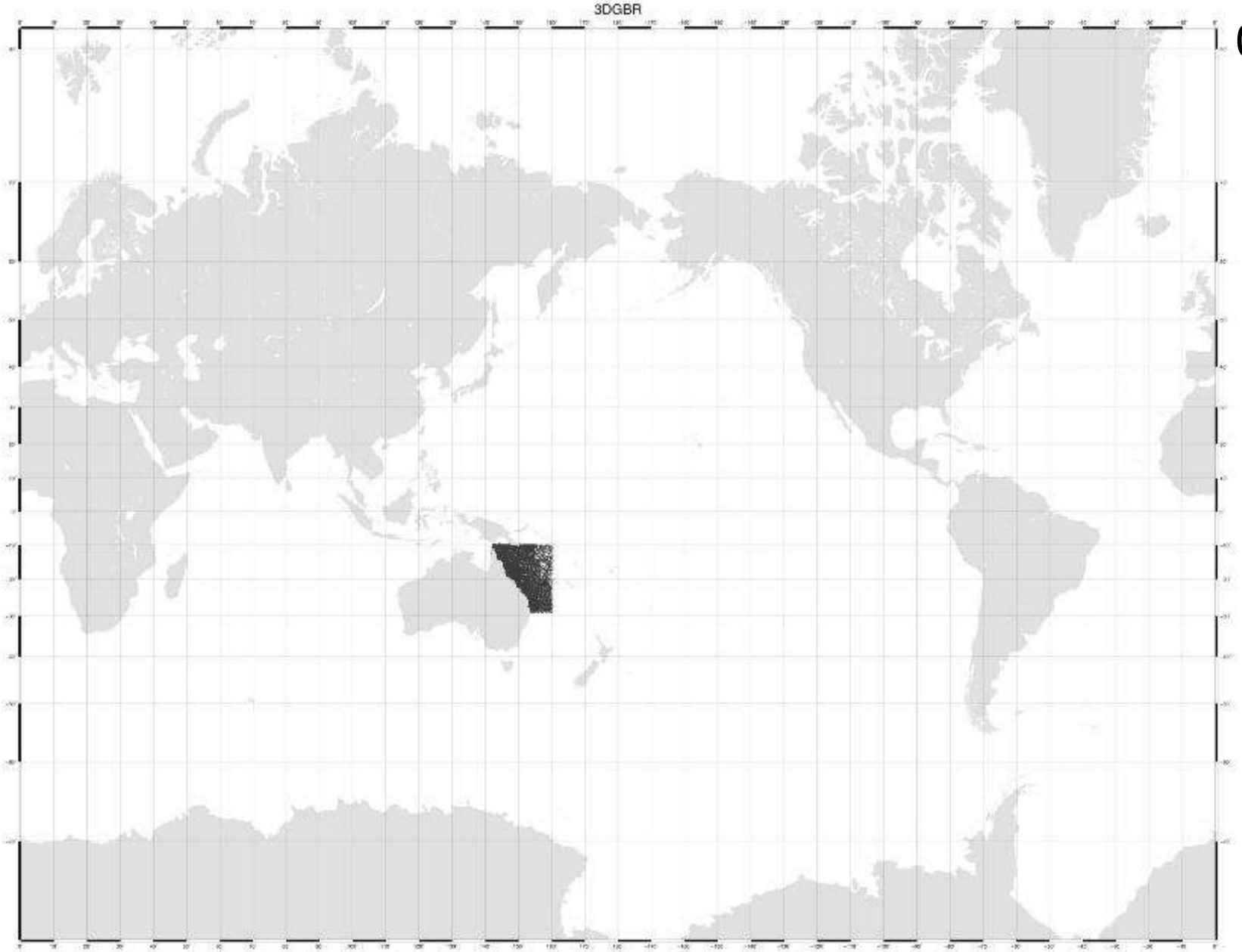

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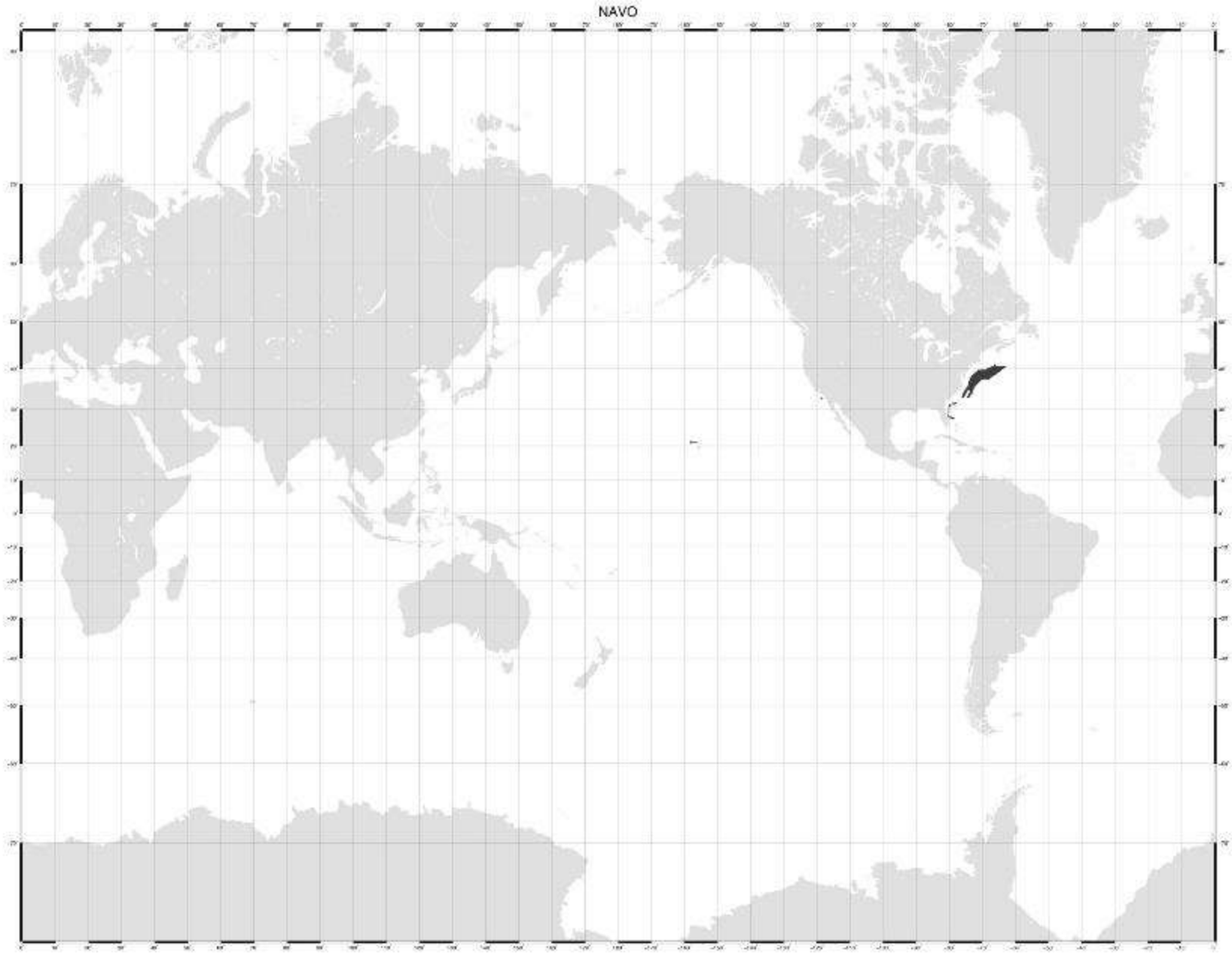

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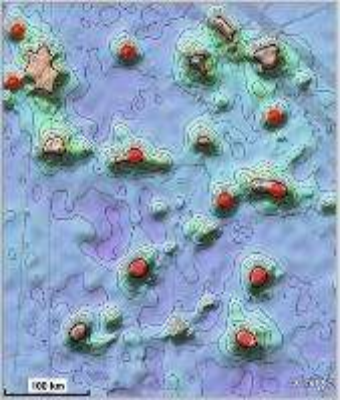

GEBCO Data Store & SRTM15_PLUS

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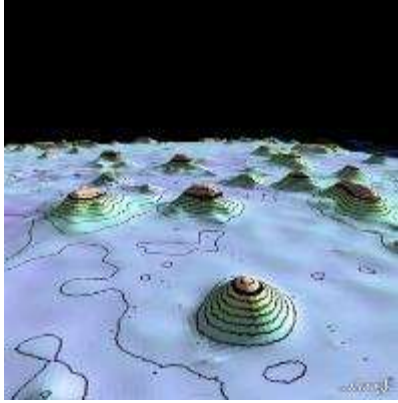

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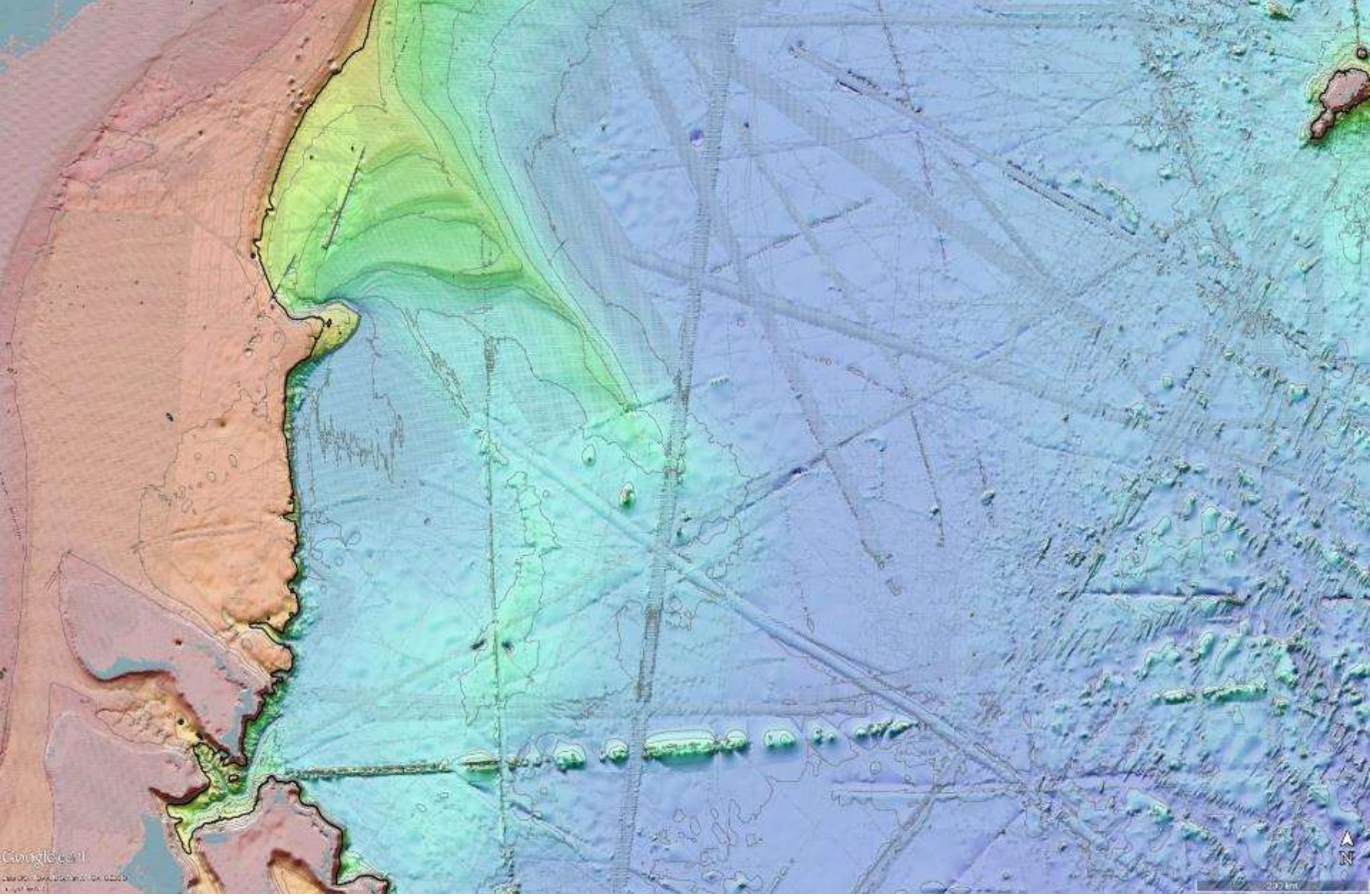

Google earth
N

Two editing approaches

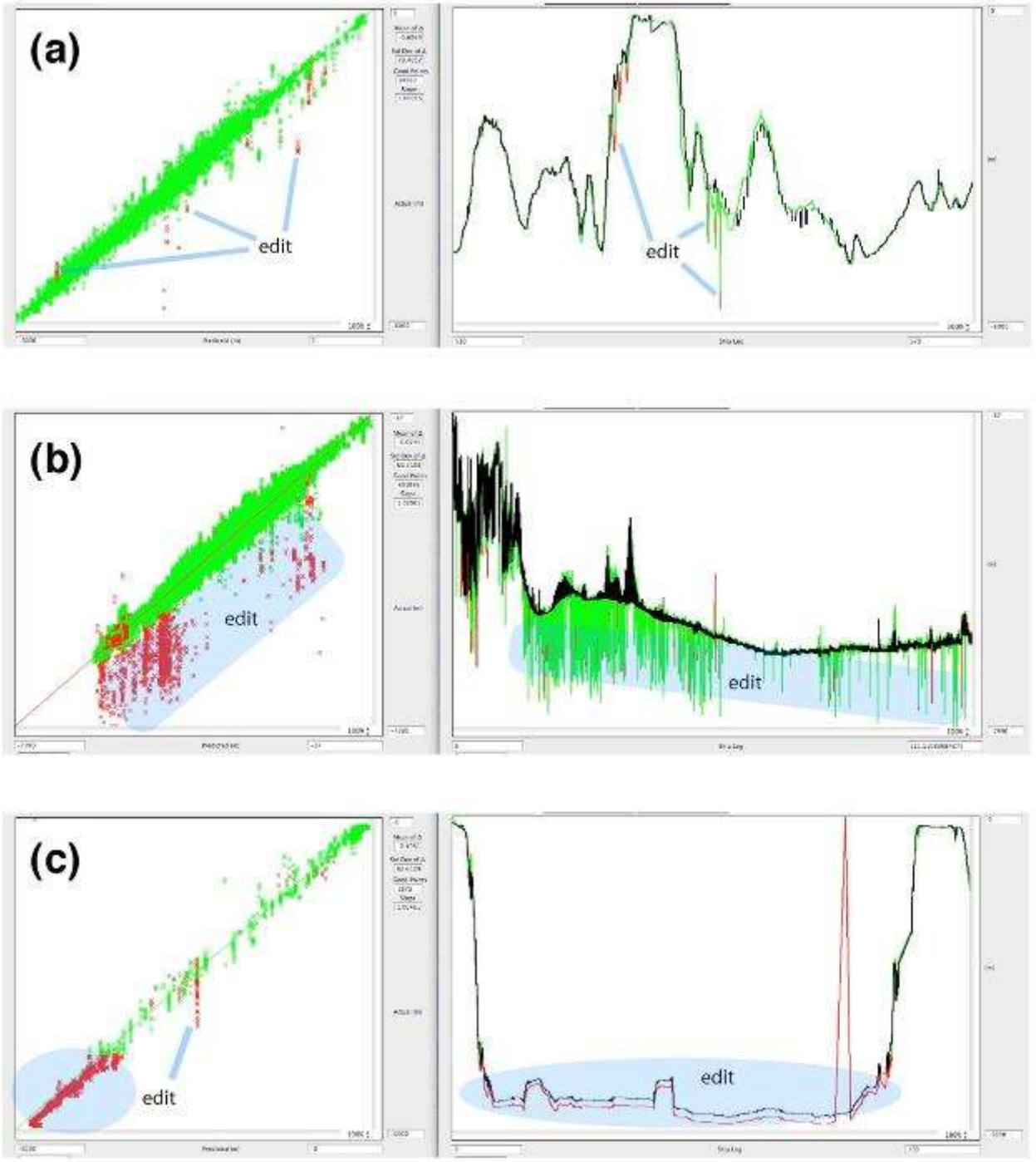
1. Compare single cruise file with predicted depth. Good initial screening of every new file. Easy to spot blunders. Time consuming.

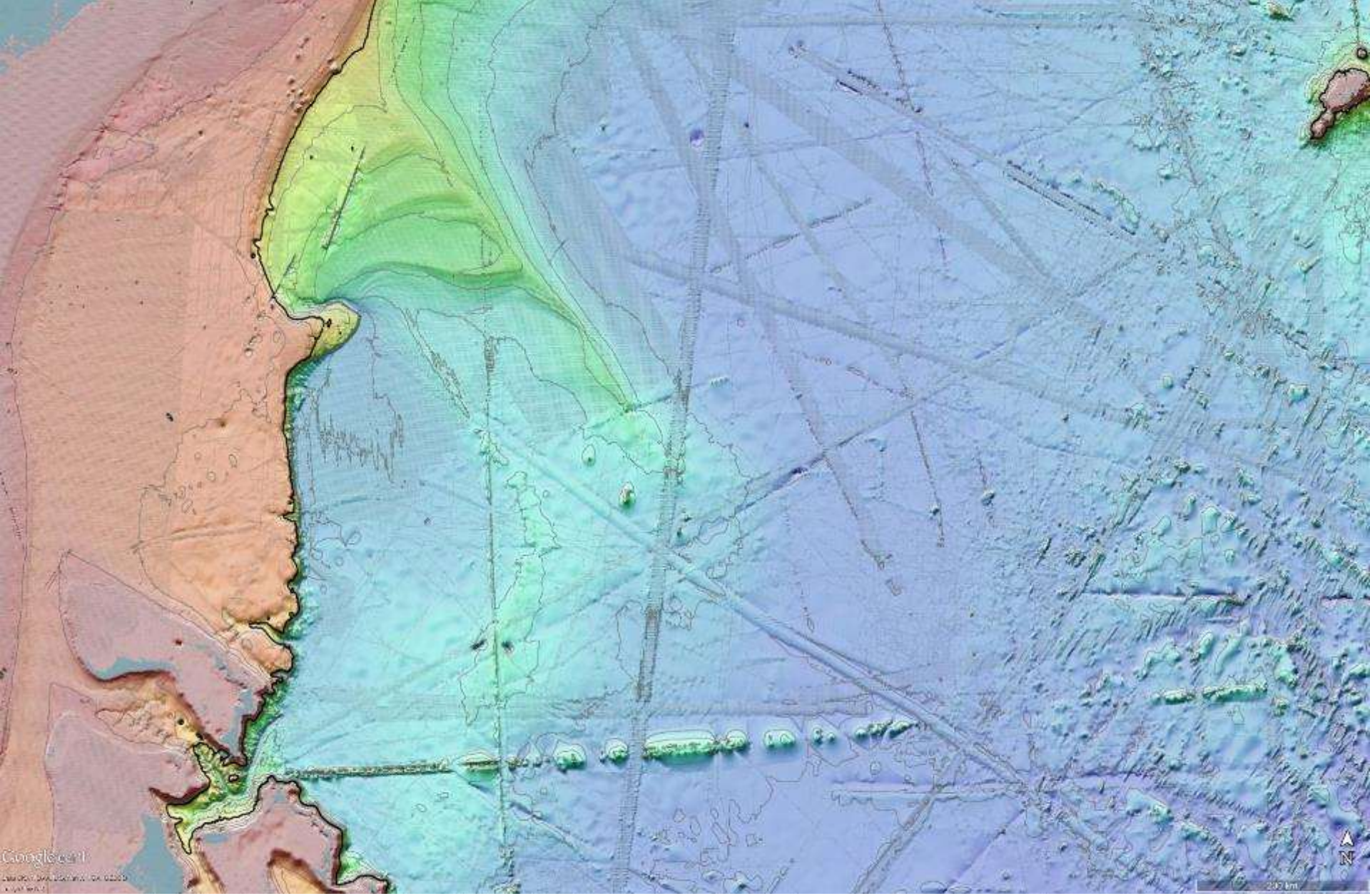
2. Look for blunders and ugly points in Google Earth guided by global gravity. Draw polygon around bad data. Use SID grid to identify cruise file(s). Flag data inside polygon(s). Time consuming.

Iterate on 1 and 2.

CM editor
Becker et al., 2009

Three examples of editing files of sounding data using a program *cmEdit*. The three windows on the left show the **statistics** window where measured depth is compared with predicted depth and the misfit statistics are displayed. The three windows on the right show the **data** window where measured depth (green) and predicted depth (black) are plotted together. The analyst highlights bad soundings (red) and the flagged data are not used in the next version of the global bathymetry grid. **(a)** Example from a single-beam cruise having a few outliers. **(b)** Example from a multibeam cruise having numerous outliers. **(c)** Example from a single-beam cruise where the deep-ocean data have a bias perhaps due to an incorrect sound velocity correction.




Google earth
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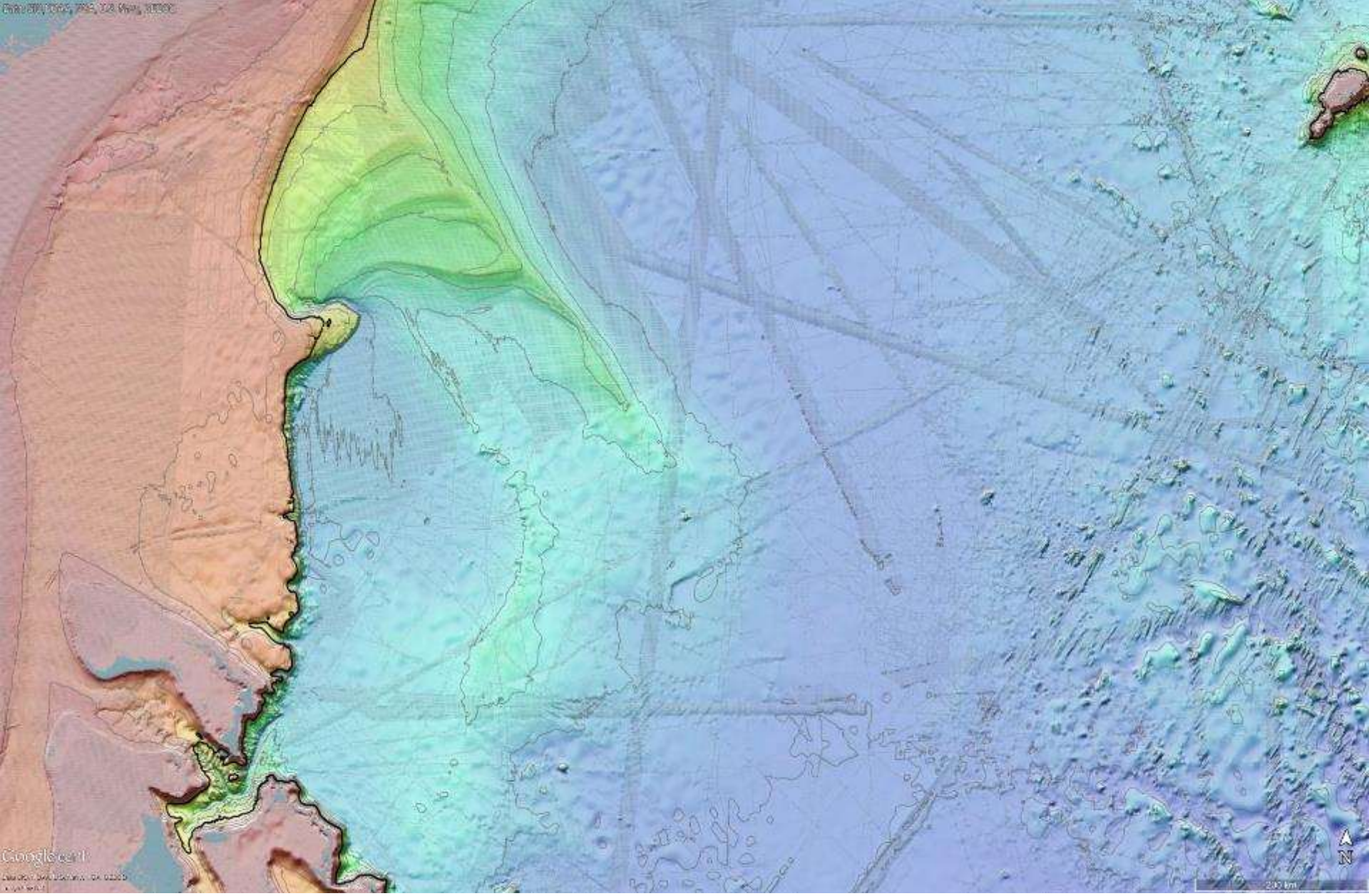

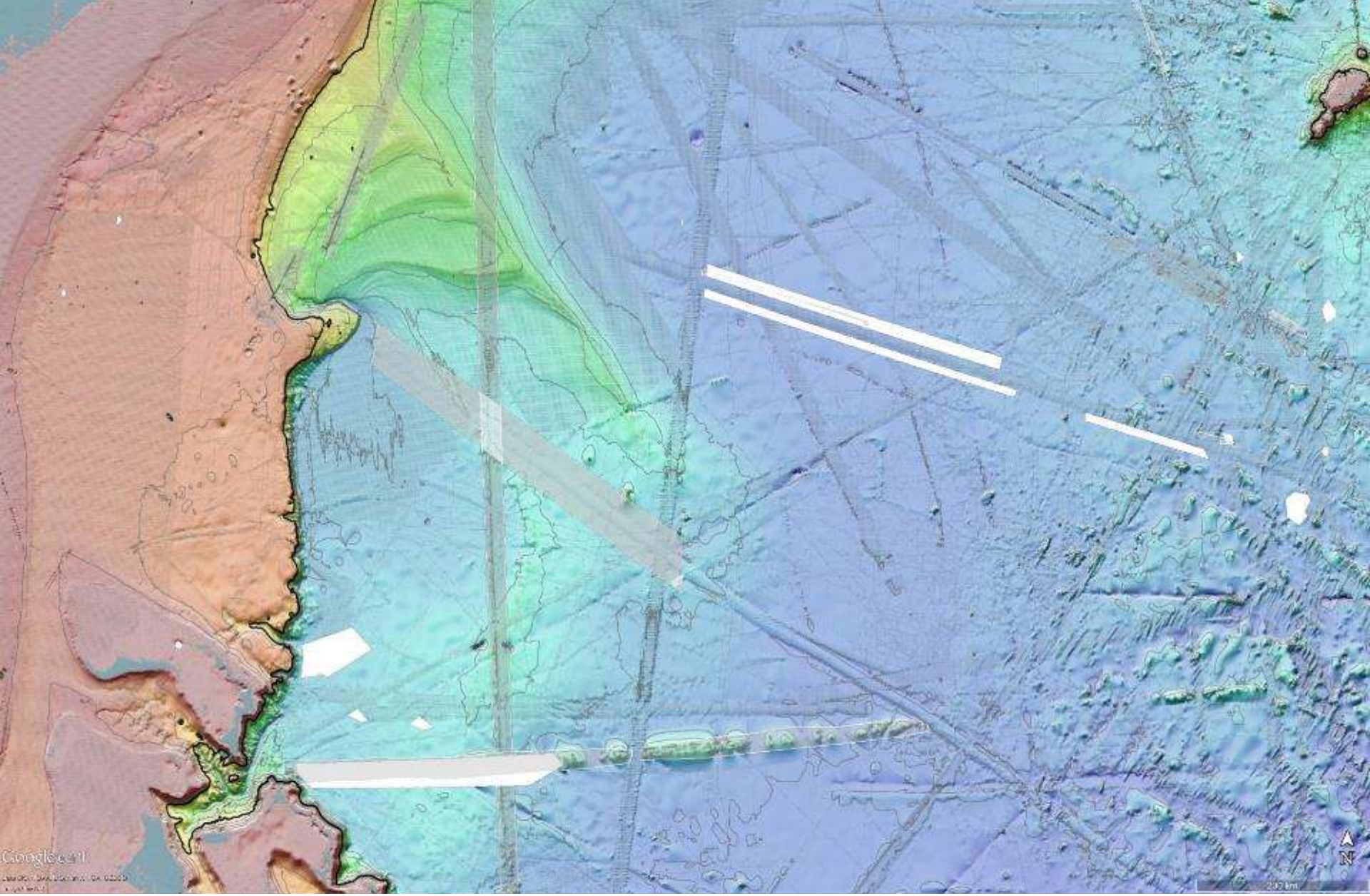
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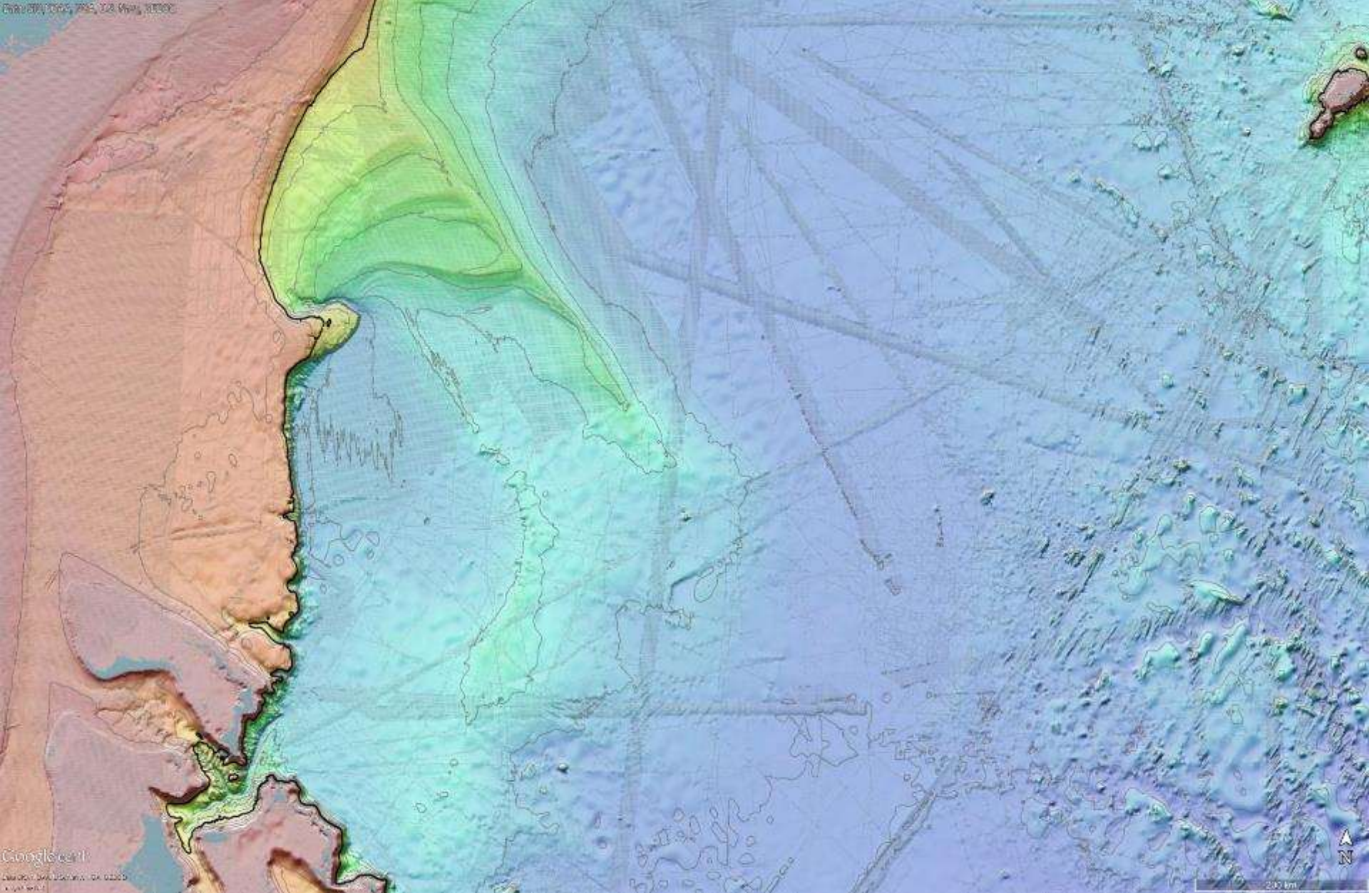
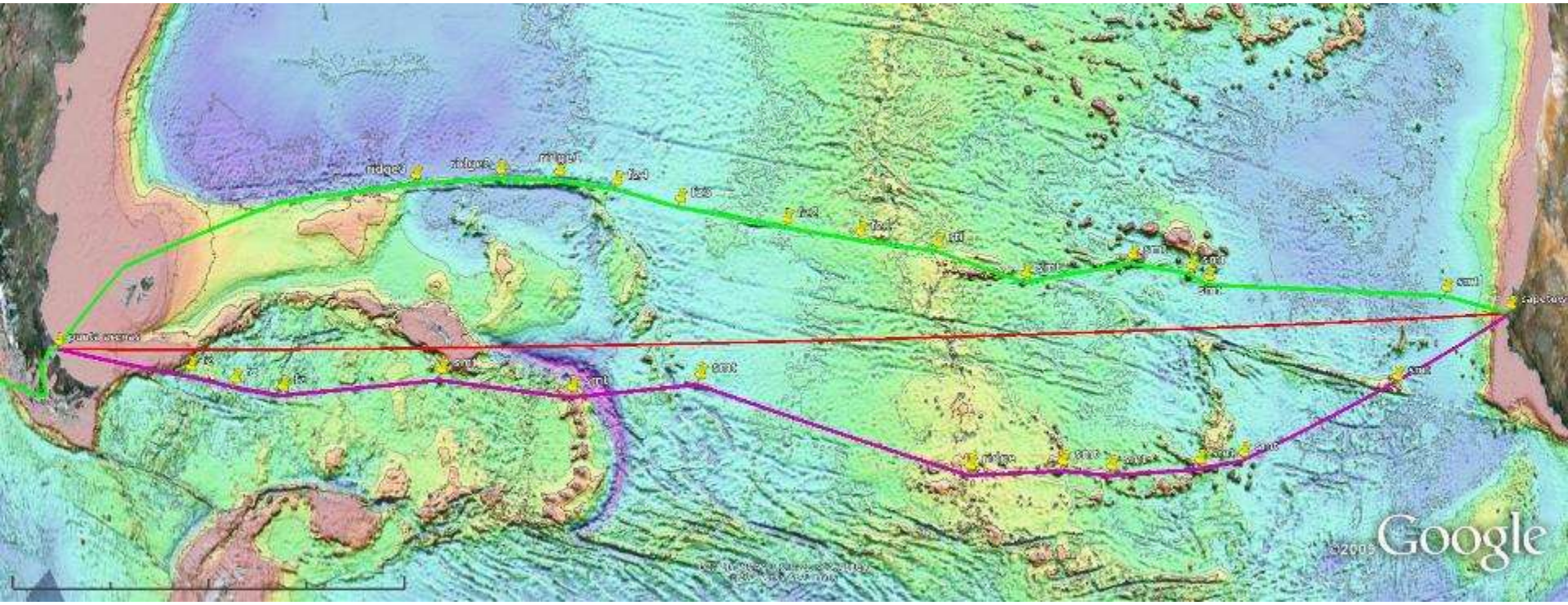


How can we do better?

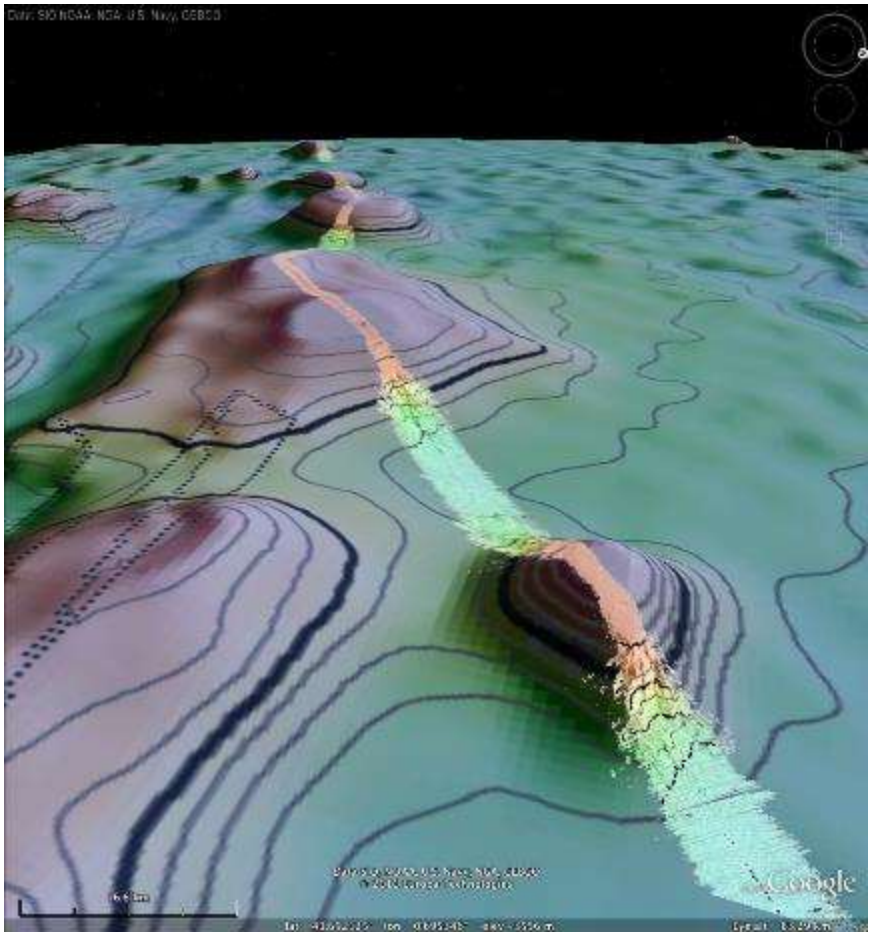
- Declassify US Navy bathymetry data.
- Launch a new satellite altimeter.
- **Improve public archives of bathymetry. (GEBCO Data Store)**
- **Map the oceans with multibeam echosounders - ships of opportunity.**

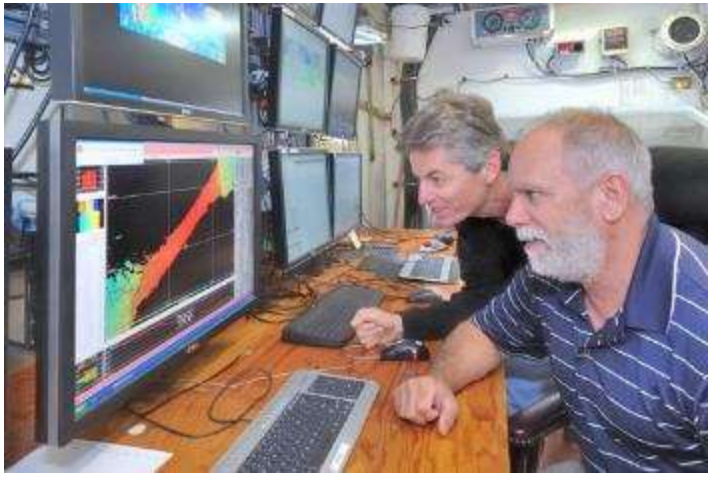
Capetown to Punta Arenas - Melville - Feb, 2011

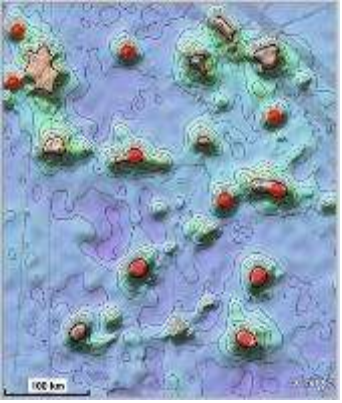
red - great circle = 6896 km
green - 10 new seamounts = 7130 km (1.034)
violet - 11 new seamounts = 7069 km (1.025)



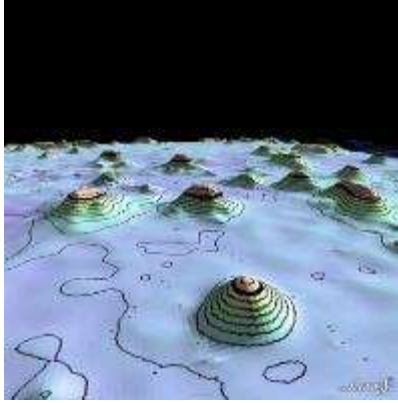
Capetown to Punta Arenas - Melville - Mar 3, 2011







Conclusions



- Ship soundings are essential for global bathymetry models. Gravity resolution is limited by the ocean depth (~4 km).
- We have assembled 16.5% sonar coverage @ 1 km cells. Smaller cells will have smaller area coverage.
- The “public” contributions are available to everyone without registration/passwords, etc.
- GEBCO could take a leading role this assembly of public data.
- The GEBCO Data Store could also guide ships of opportunity.