

E/V Nautilus North Pacific Mapping and Exploration – Seamounts, Lava and Mapping the Gaps

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Mapping and Science Coordinator
Ocean Exploration Trust



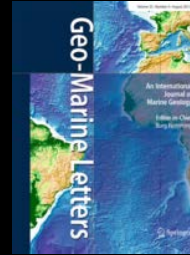
Map the Gaps
November 14, 2018



EXPLORATION vs. TRADITIONAL RESEARCH

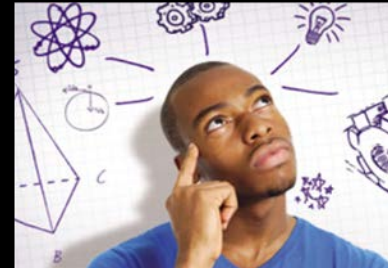
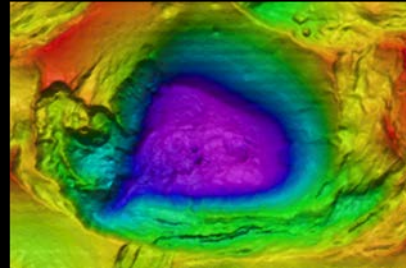
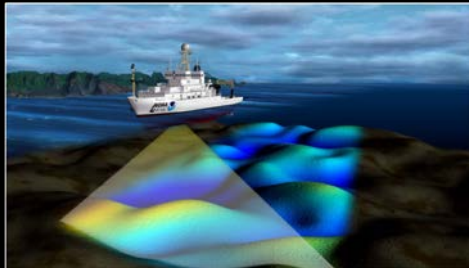
Science - Hypothesis Testing:

HYPOTHESIS → RESEARCH → ANSWERS



Exploration - Hypothesis Generating:

EXPLORATION → DISCOVERY → HYPOTHESIS

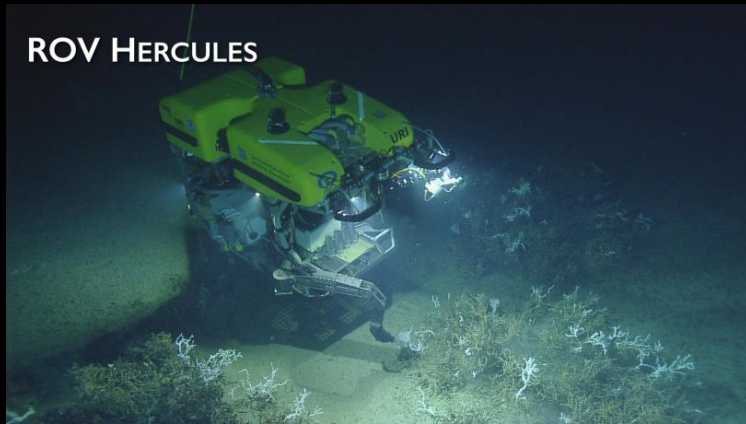




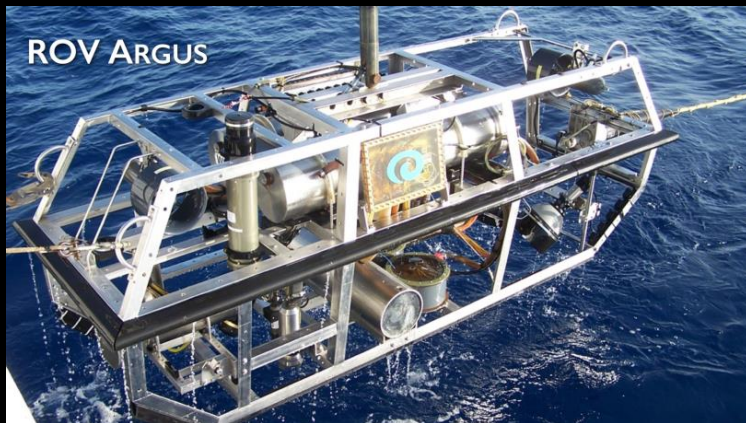
OPERATIONS & CAPABILITIES

Noritas - April 2013 - November 2016

ROV HERCULES



ROV ARGUS

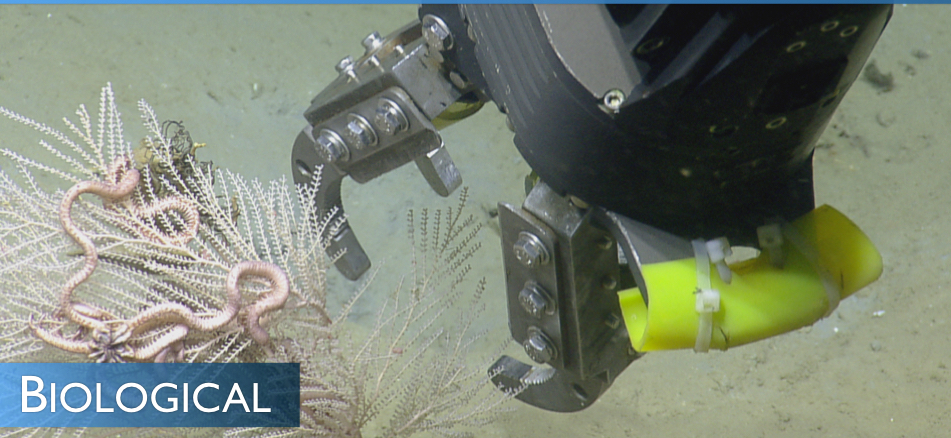


EM302 Multibeam





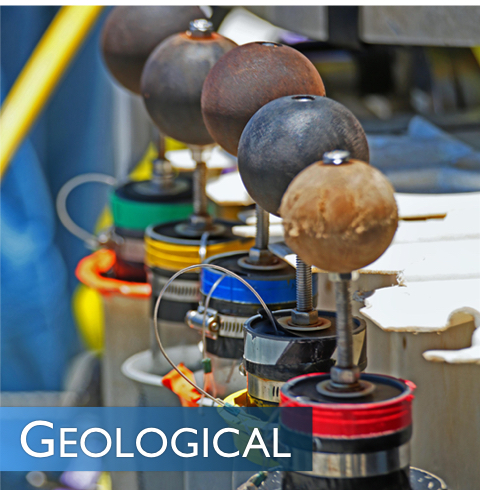
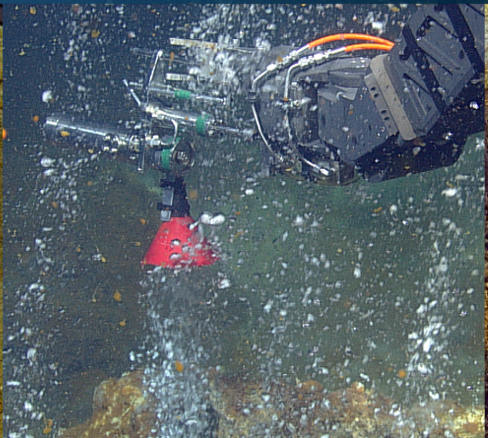
ROV SAMPLING CAPABILITIES



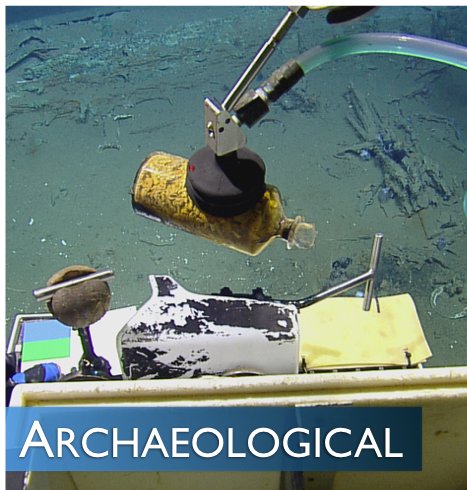
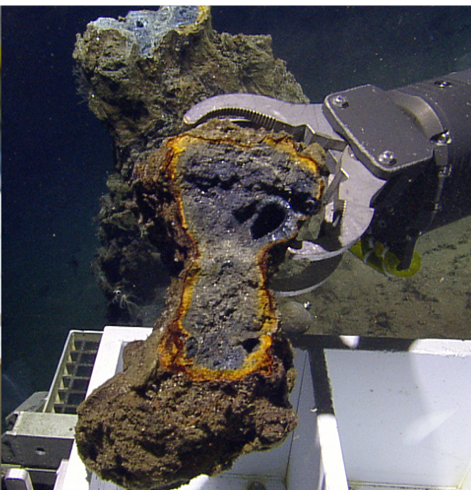
BIOLOGICAL



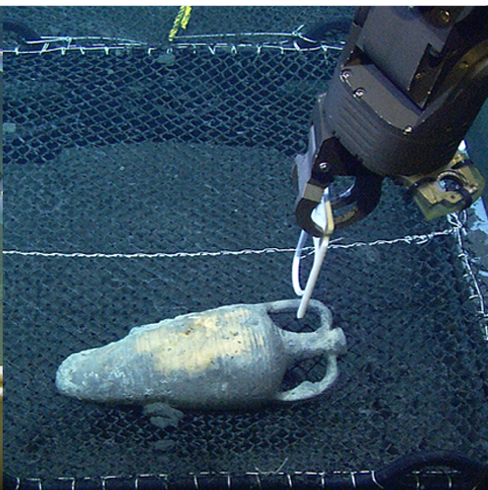
WATER & GAS



GEOLOGICAL



ARCHAEOLOGICAL





OPERATIONS & CAPABILITIES

Nathans - April 2013 - Knapok 500°



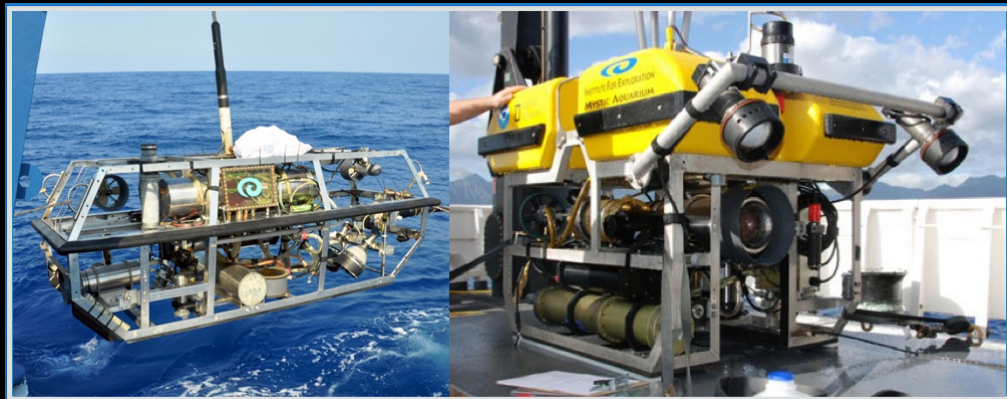
National Geographic Society
Deepwater Drop-cam





OPERATIONS & CAPABILITIES

Norix - April 2013 - Knudsen 500



ROV 6000m Mobile System 2019

ASV hi-resolution mapping



OCEAN NETWORKS CANADA

CASCADIA MARGIN

PACIFIC SEAMOUNTS

MONTEREY BAY

CHANNEL ISLANDS

PAPAHĀNAUMOKUĀKEA
MARINE NATIONAL MONUMENT

LOIHI SEAMOUNT

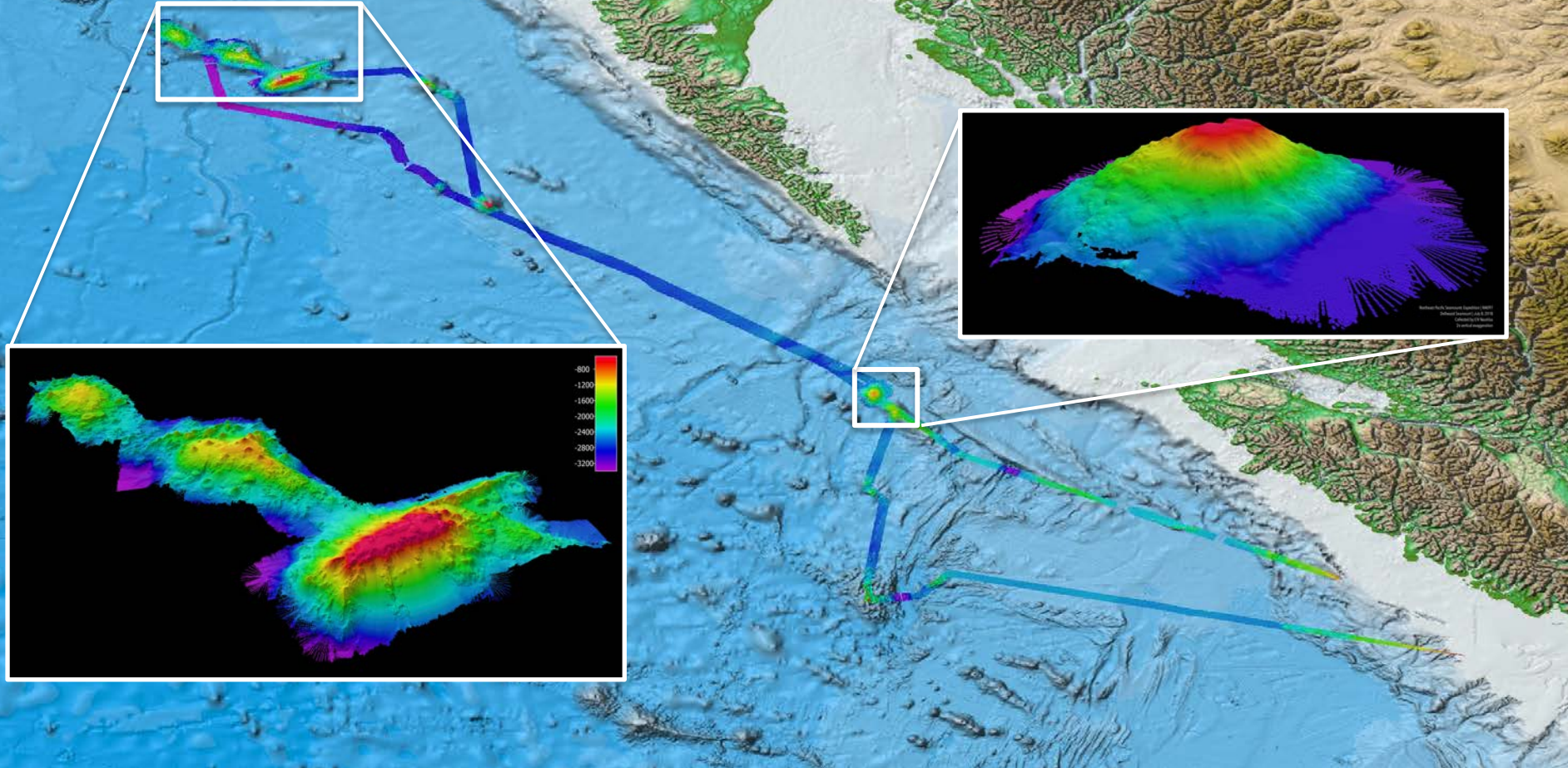
CLARION CLIPPERTON
FRACTURE ZONE

NAUTILUS LIVE

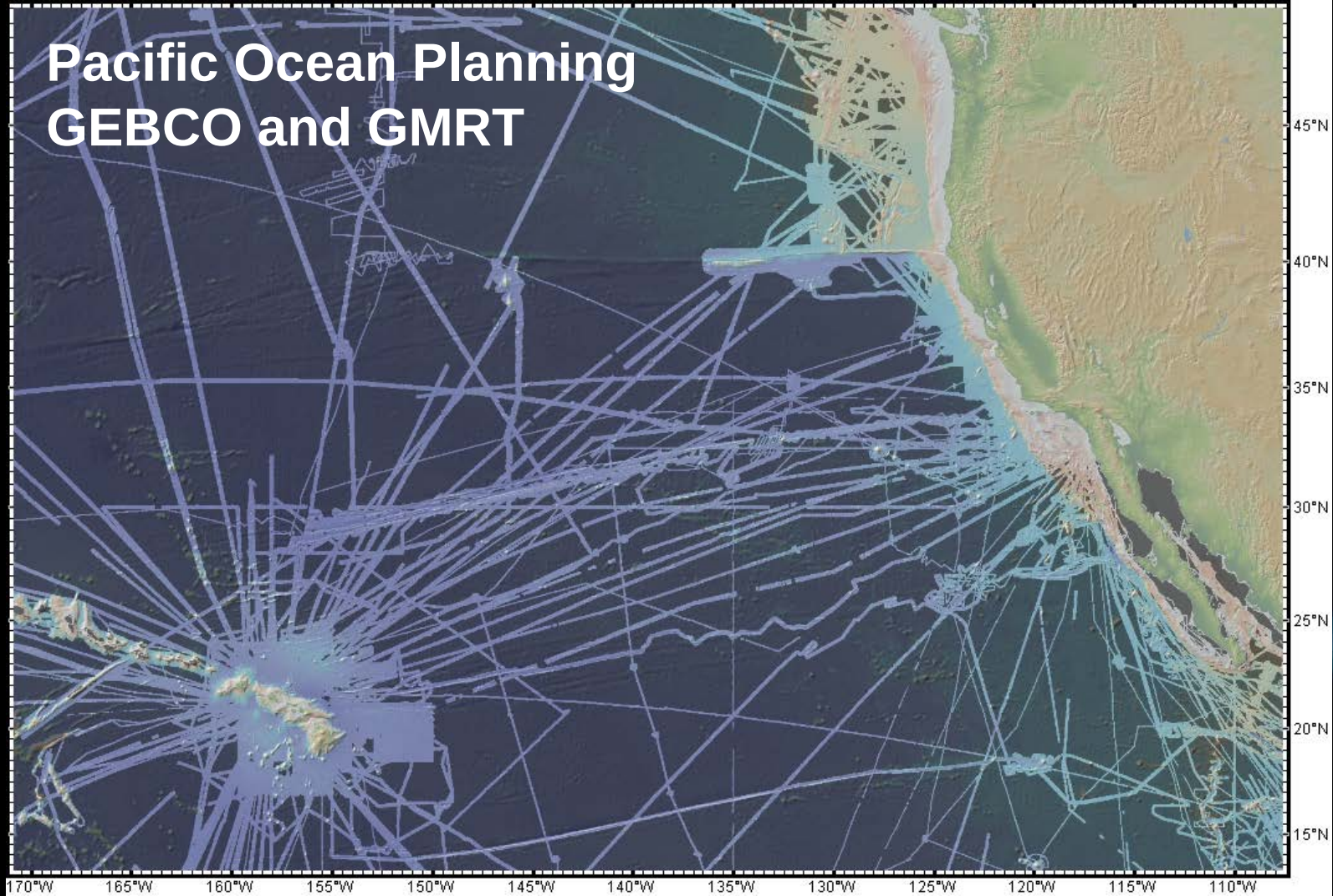
2 0 1 8

Northeast Pacific Seamounts

Department of Fisheries and Oceans Canada



Pacific Ocean Planning GEBCO and GMRT



*Images GEBCO &
GeoMapApp*

Nautilus Transit Mapping

North Pacific Ocean

CV Nautilus

Google Earth

Image Landsat / Copernicus

© 2018 Google

© 2018 INEGI

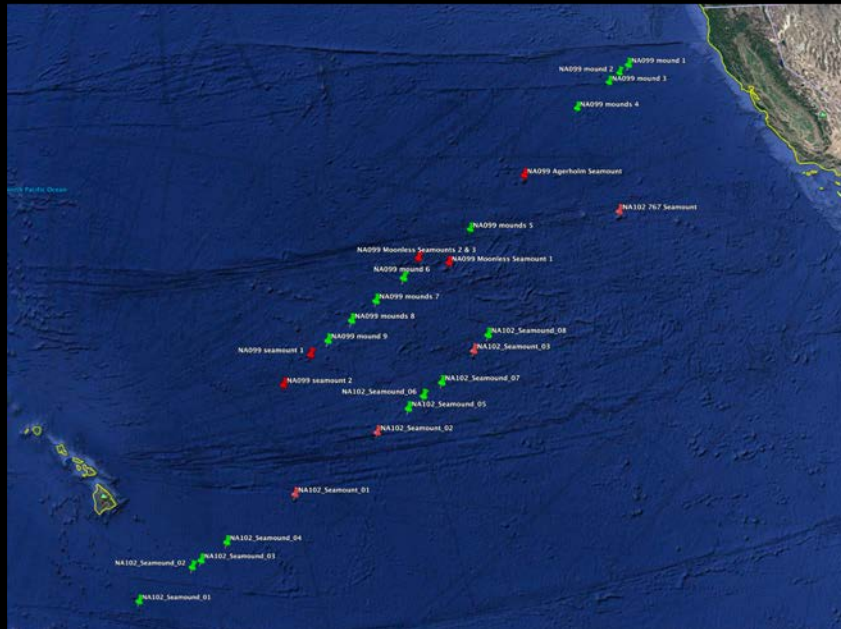
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

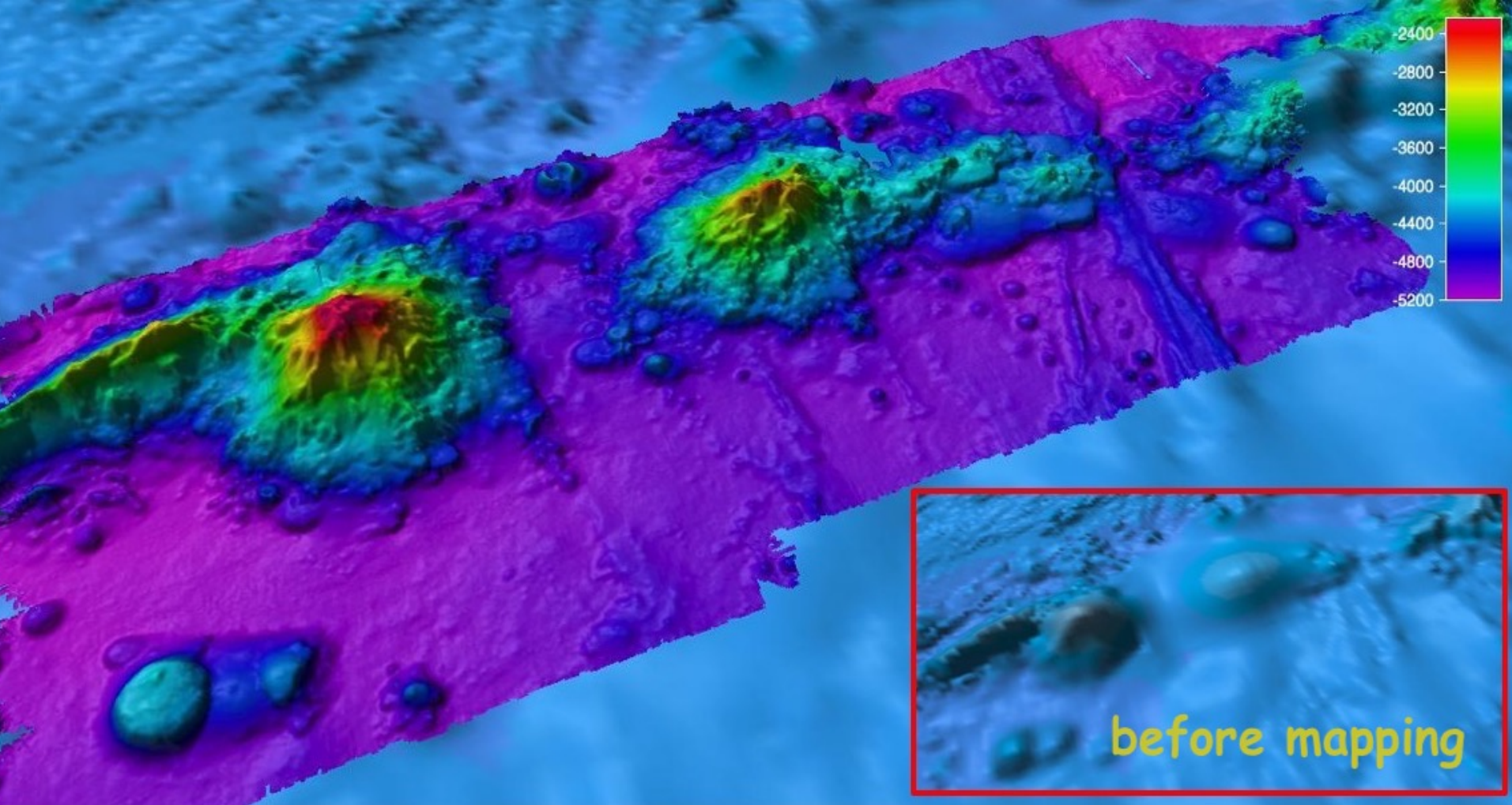


1000 mi

NA099 and NA 102 – Seamounts and mounds

Differences in depth, position and size between mapped, charted and predicted bathy

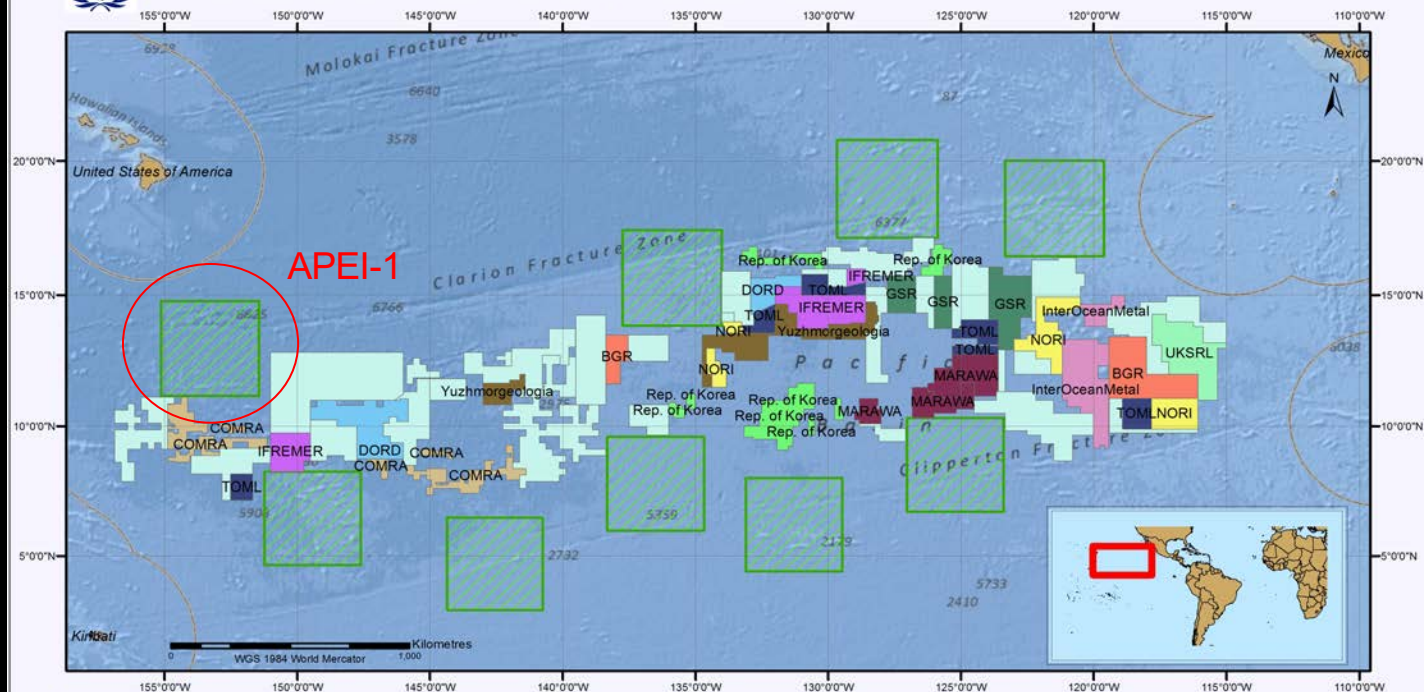






Polymetallic Nodules Exploration Areas in the Clarion-Clipperton Fracture Zone

Areas under contract and areas reserved for the International Seabed Authority



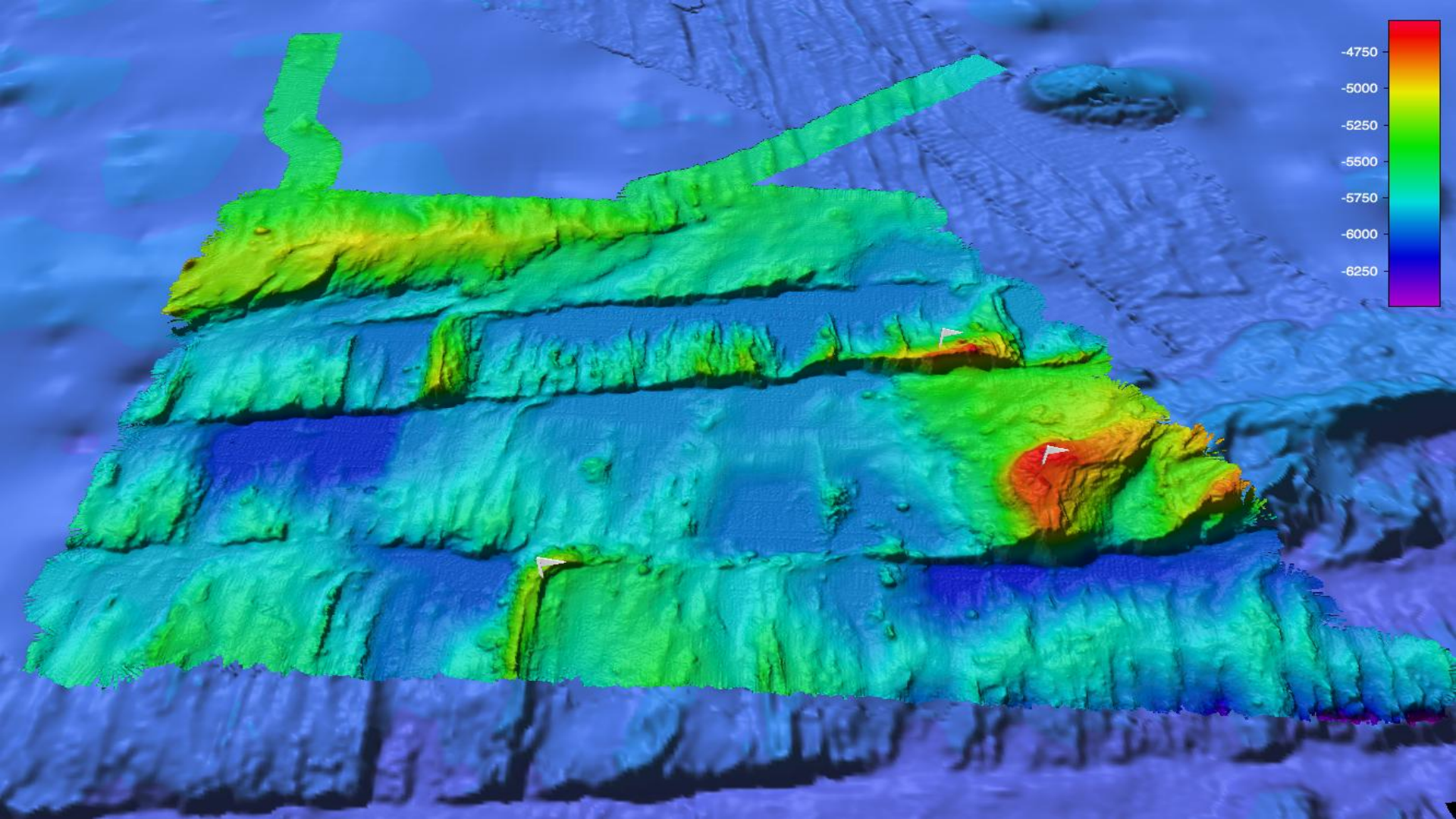
Contract area or contract approved as of 28 February 2013

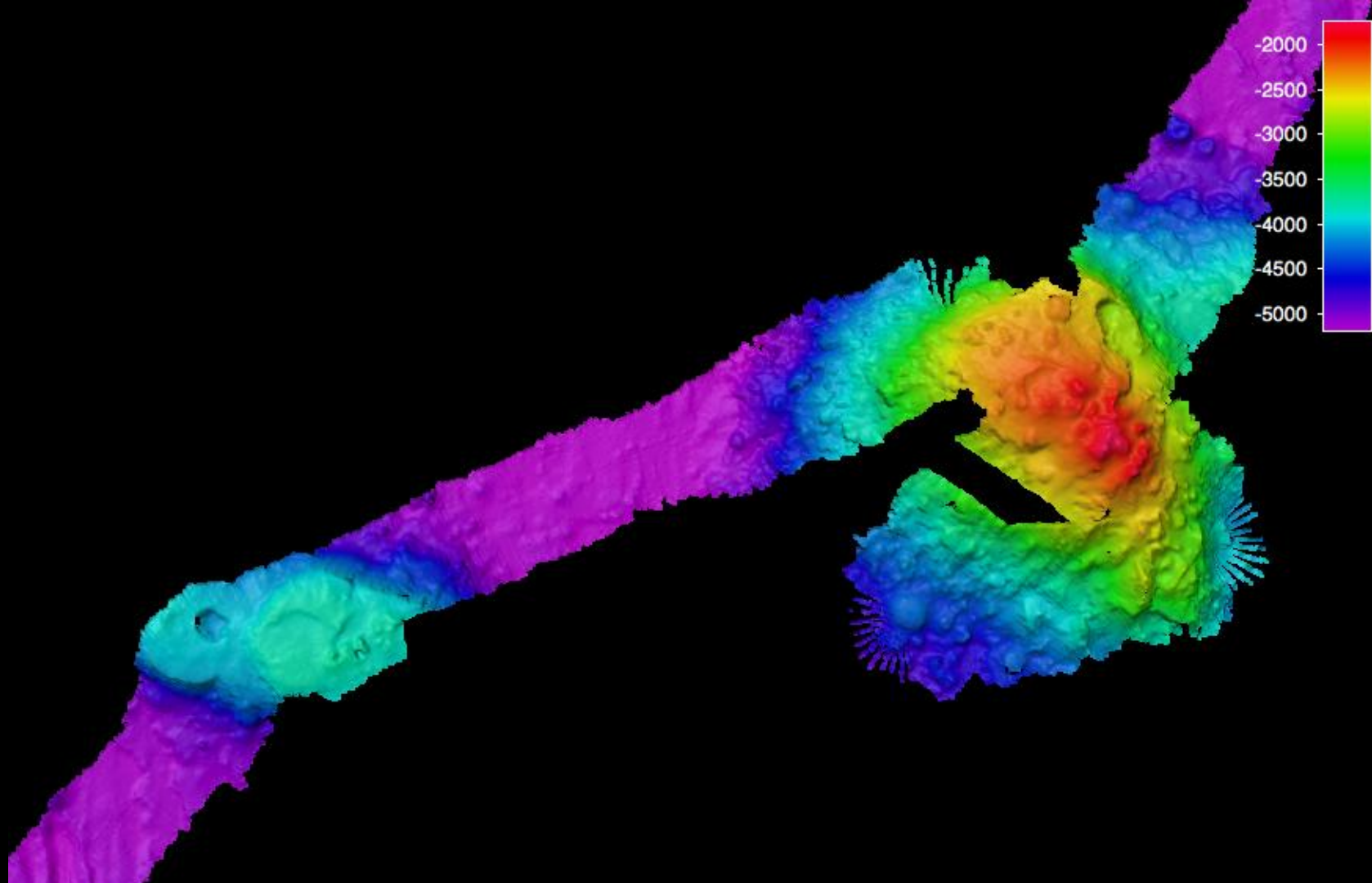
- | | |
|---|---|
| Marawa Research and Exploration Ltd (Kiribati) | Institut français de recherche pour l'exploitation de la mer (IFREMER; France) |
| Bundesanstalt für Geowissenschaften und Rohstoffe (BGR; Germany) | Interoceanmetal (IOM; Bulgaria, Cuba, Czech Republic, Poland, Russian Fed., Slovakia) |
| 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) |

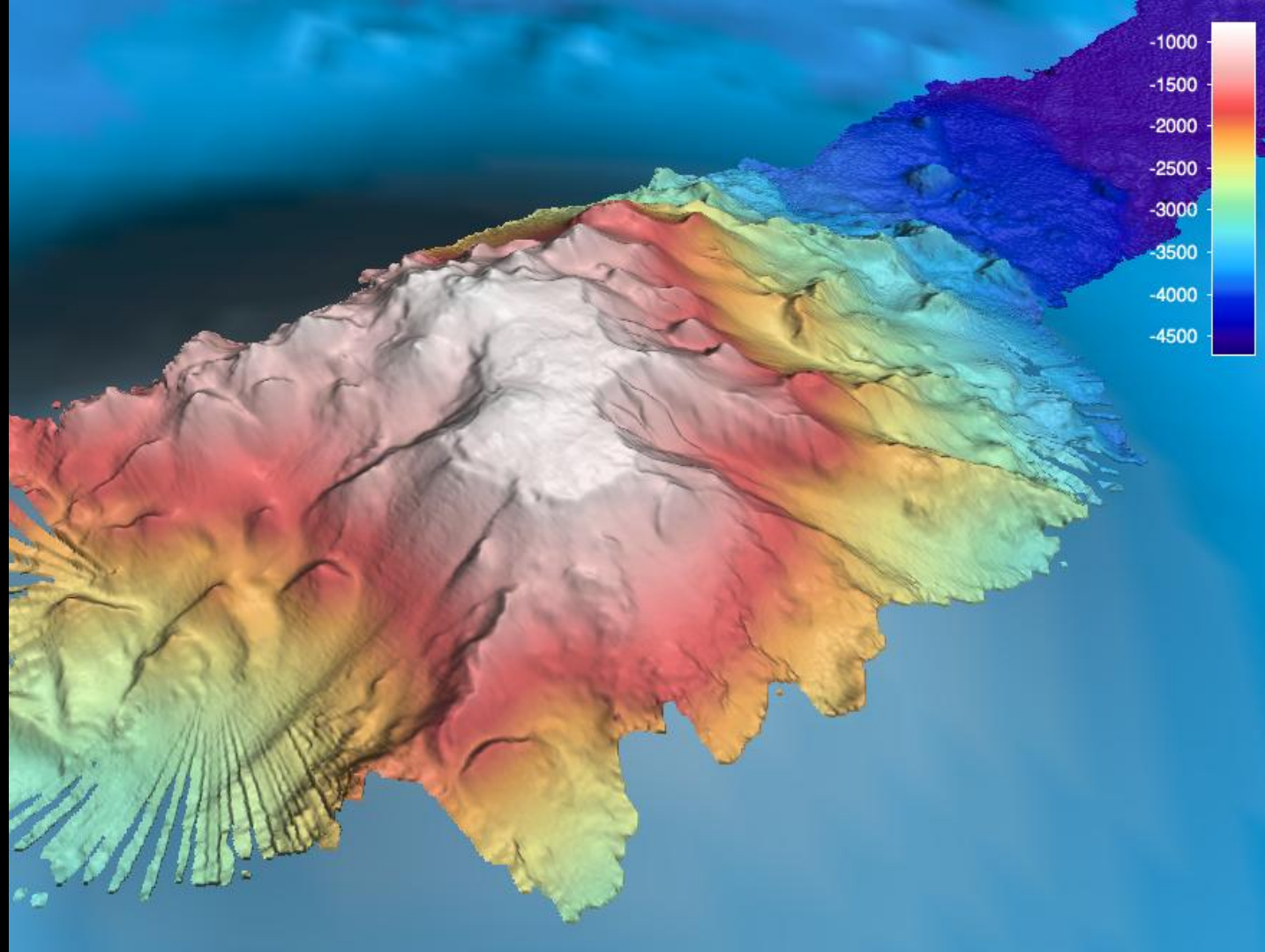
Reserved area* Area of particular environmental interest (APEI)** Exclusive Economic Zones (VLIZ, 2011)

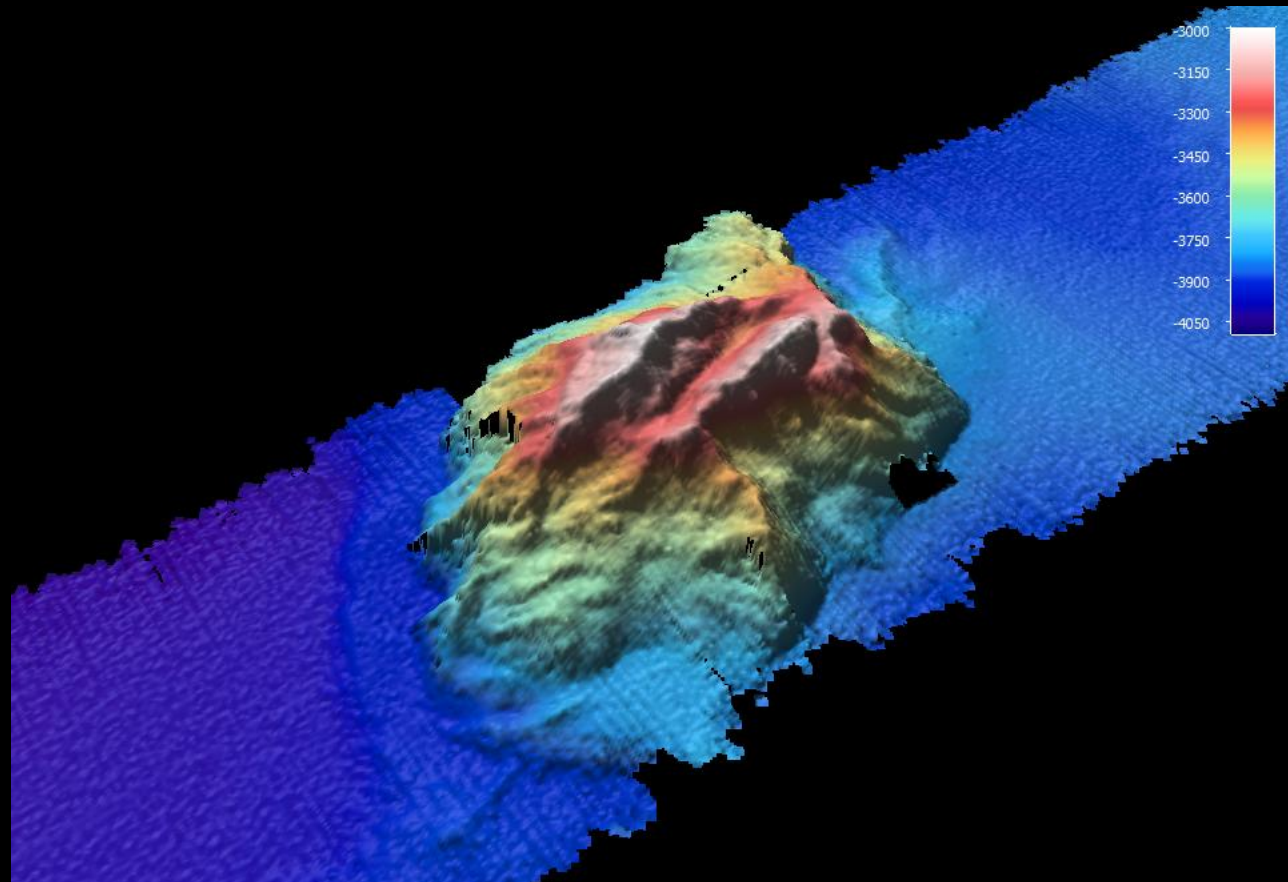
* In the case of polymetallic nodules, the so-called parallel system provides that each application for exploration by a developed State must cover two parts of "equal estimated commercial value". One part is allocated to the applicant and the other is to become the reserved area, which is set aside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



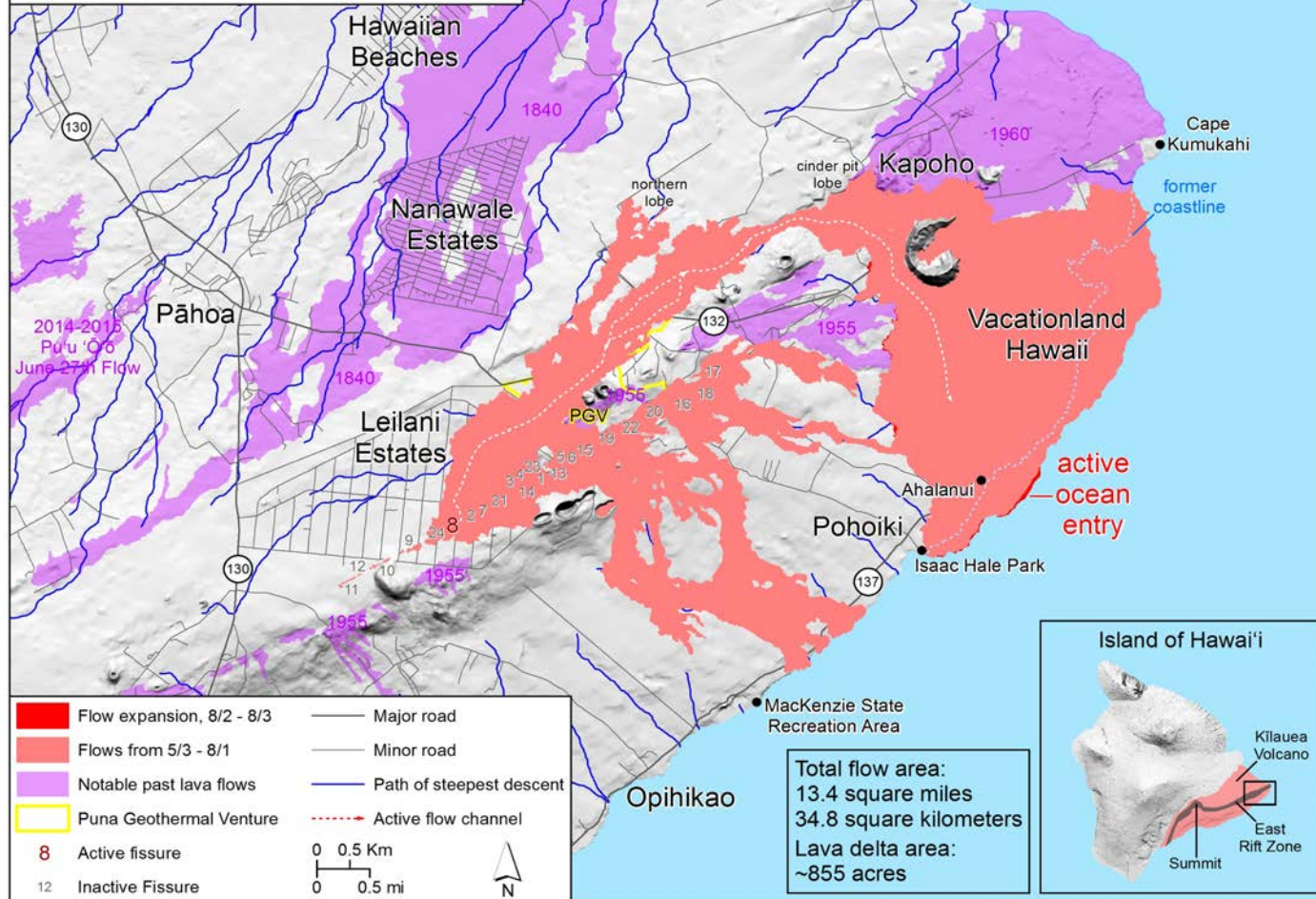


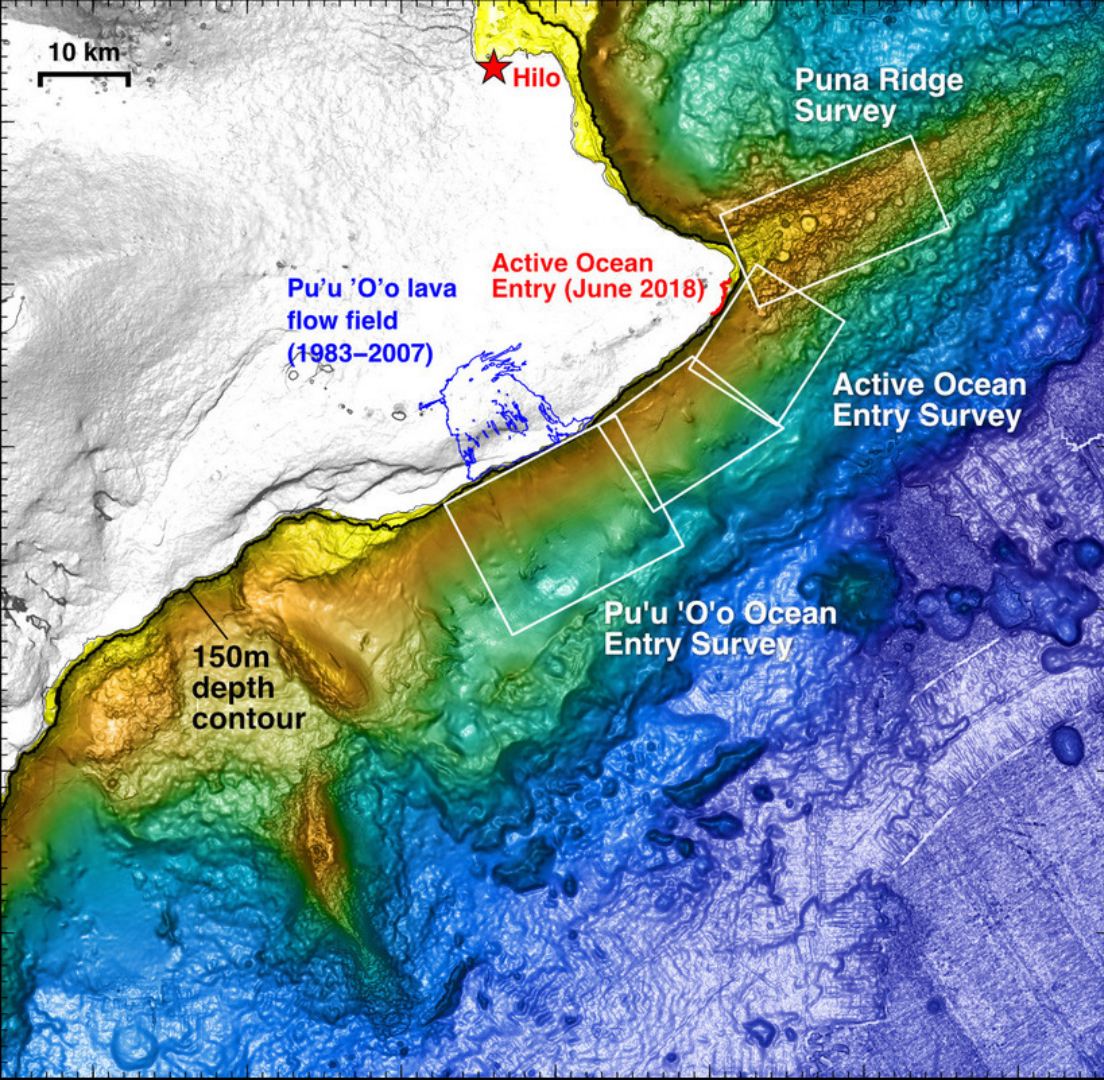




Kīlauea Volcano - East Rift Zone

Updated 10:00 am, August 3, 2018



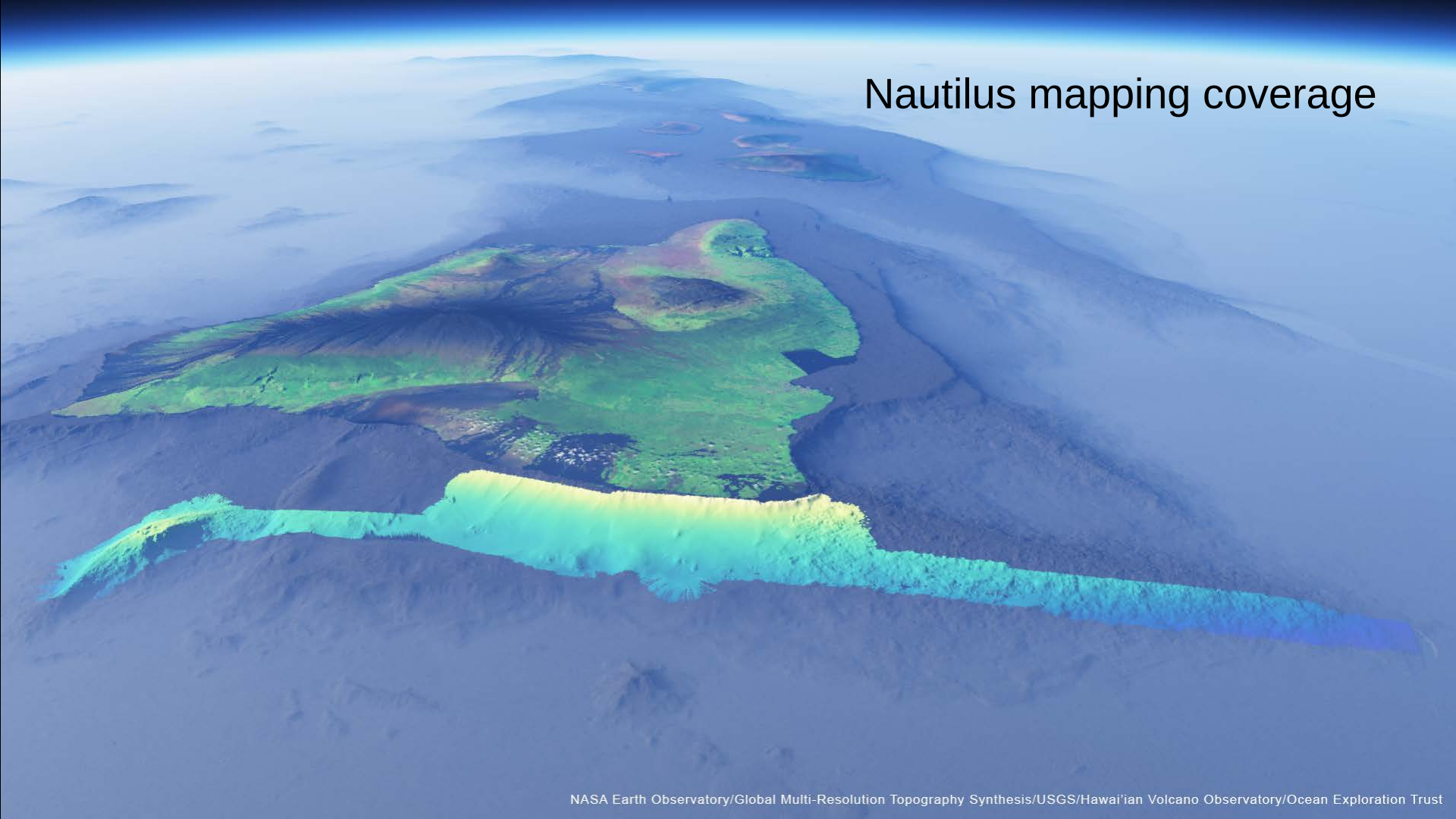


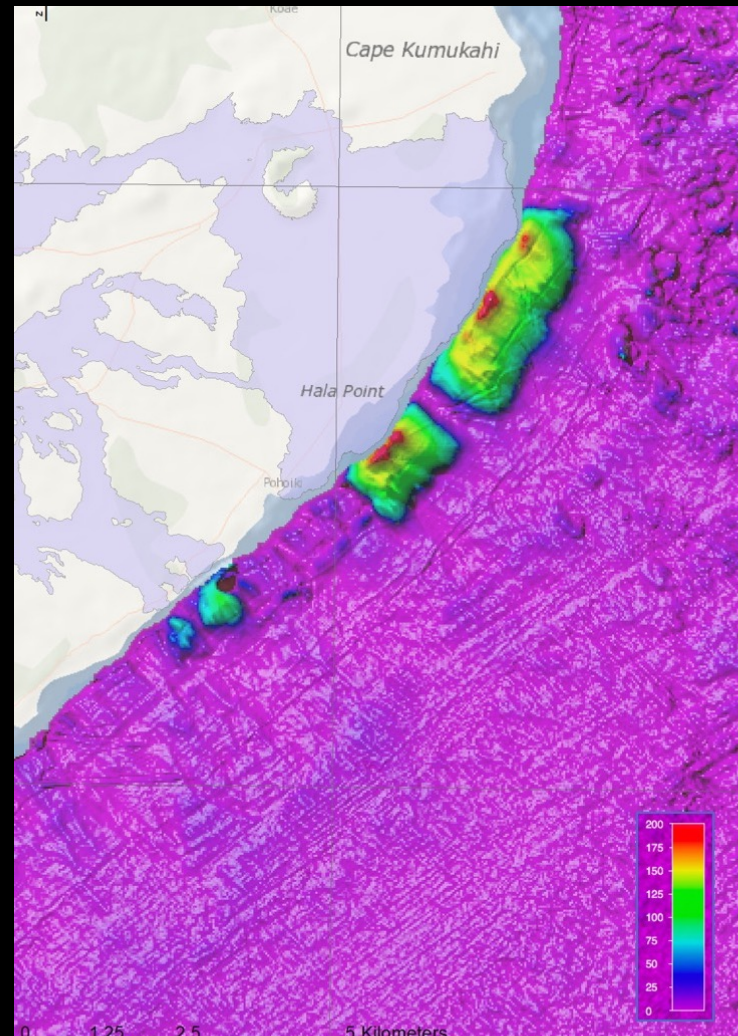
NA099 – Lead scientist
Larry Mayer (CCOM UNH)

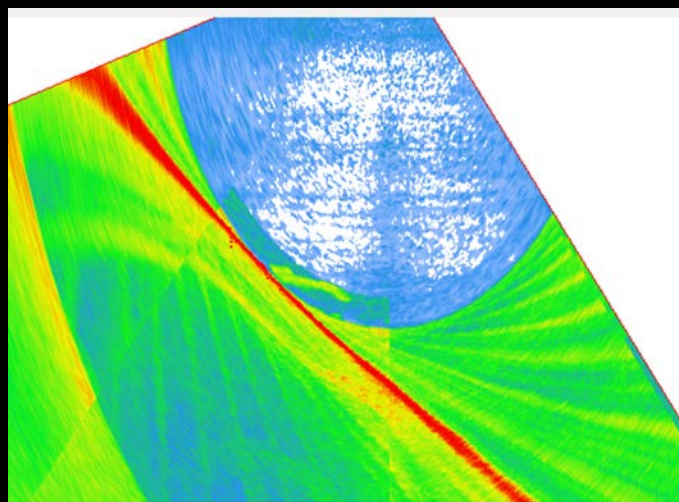
Kilauea mapping -
Lead scientist ashore
Adam Soule (WHOI)

NA100 – Co-Leads
Chris German (WHOI)
Darlene Lim (NASA)

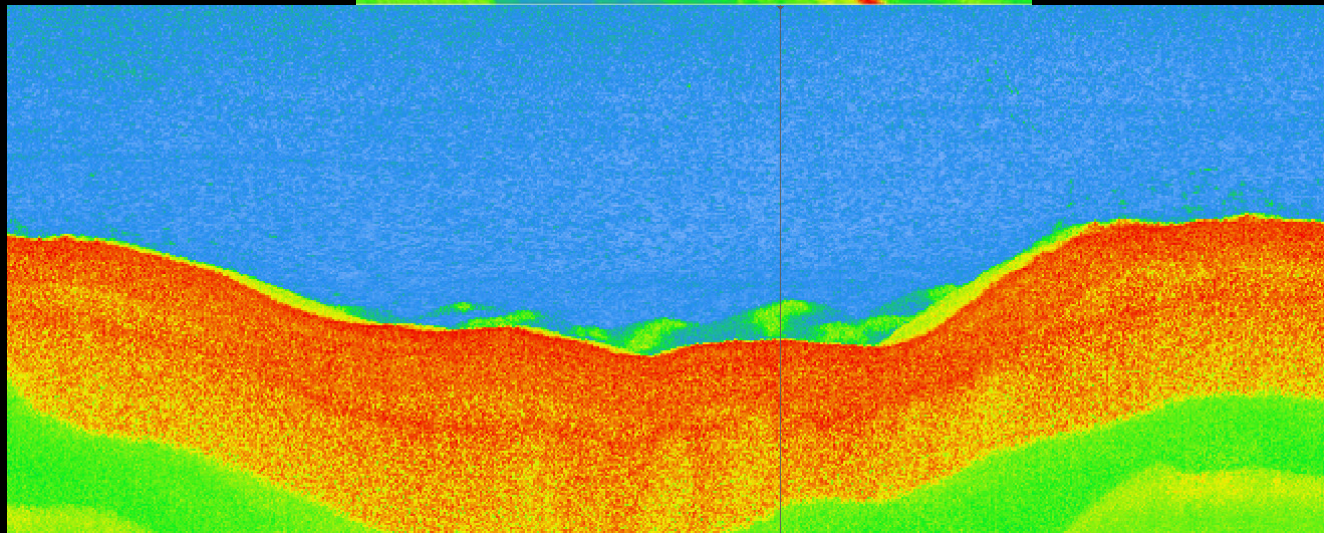
Nautilus mapping coverage

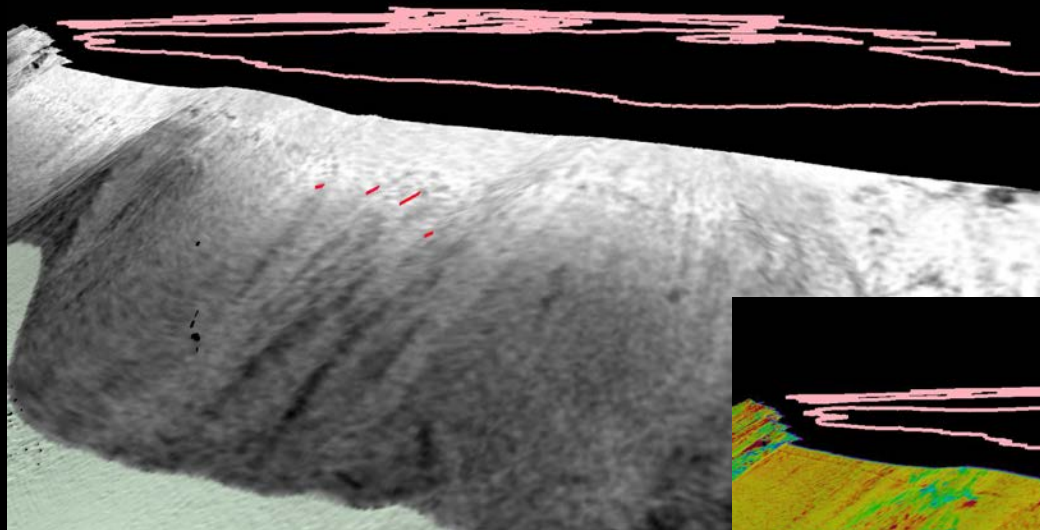




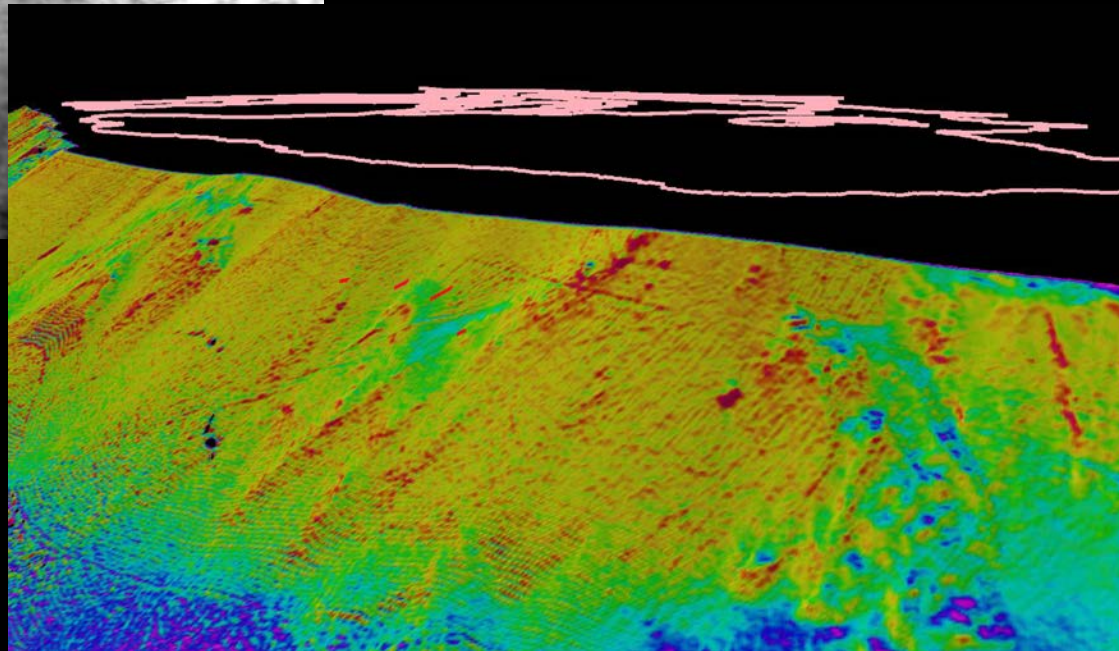


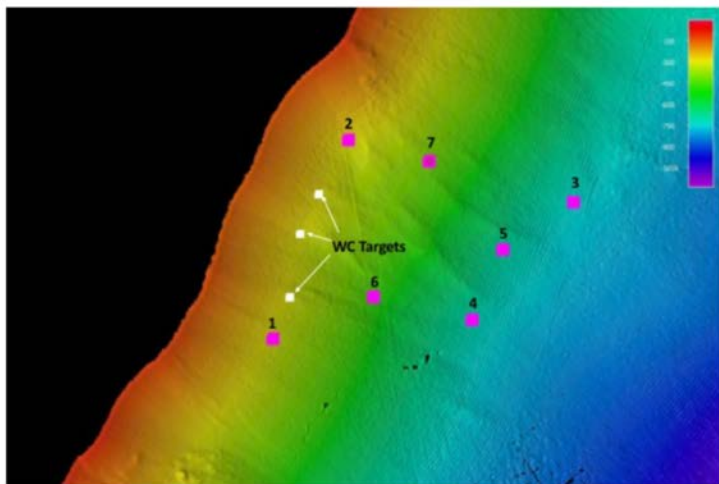
NA099 water column
contacts



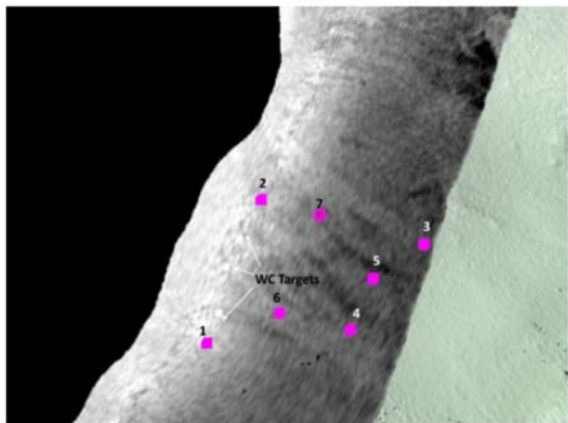


NA099 water column
contacts



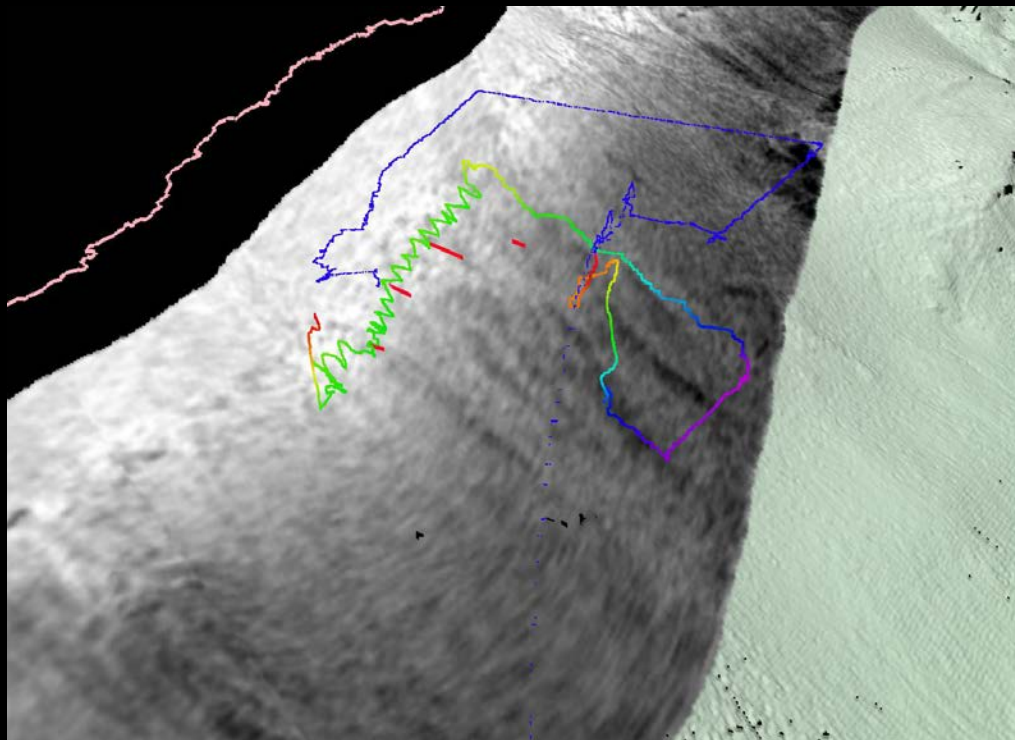


5 m grid bathymetry data with waypoints (magenta) and water column picks (white)



Backscatter data with waypoints (magenta) and water column picks (white)

NA100 ROV Dive H1714



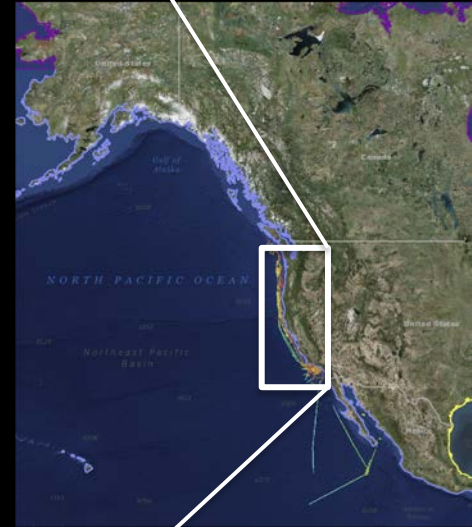
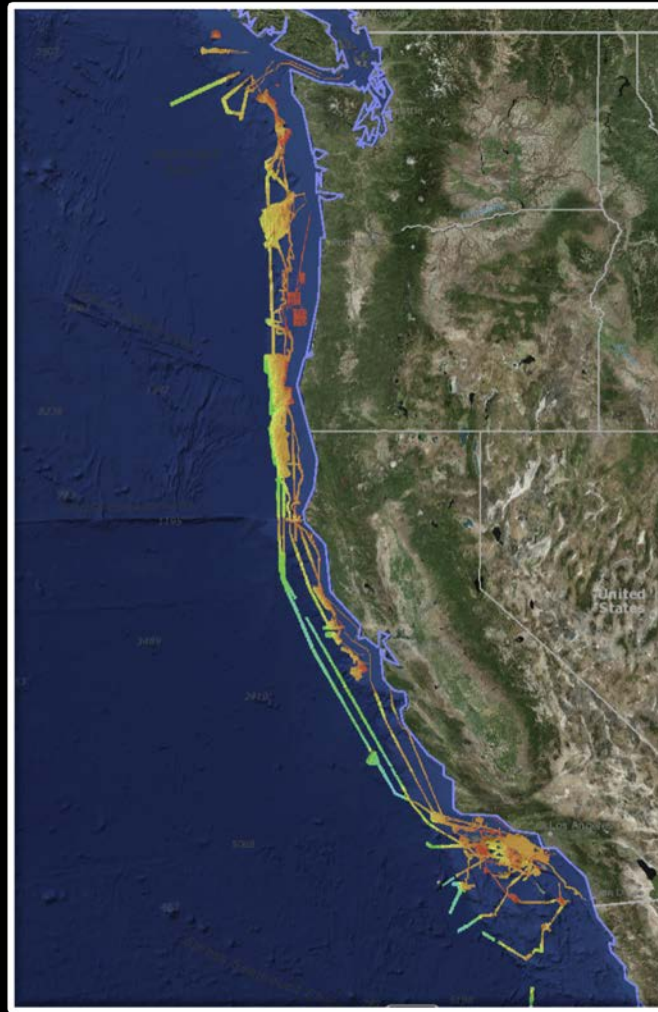


Mapping Products Per Survey:

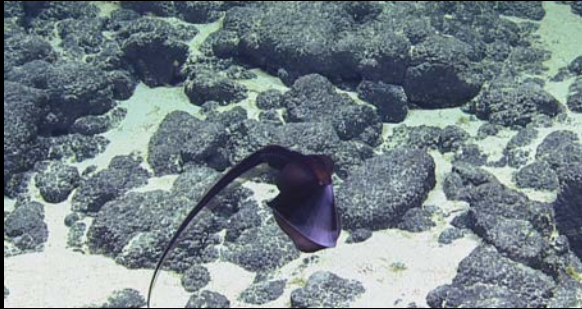
- GSFs, geotiff images & floating point, SD file, KML, polygon, survey report, line file report, extinction report, processing log
- Outreach products (handled by production for NL & social media)

Public Access and archive

- OET archive and access
- 2018 Rolling Deck to Repository to NCEI
- Seabed 2030 North Pacific contribution >100 km²

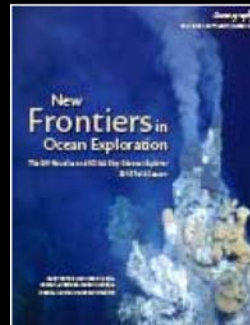


Mapping - Beginning of Exploration



Expedition Planning & Data Availability

- Lead scientist represents wider scientific community interests
- Scientists Ashore
 - Sign up online (www.oceanexplorationtrust.org)
 - Planning calls
 - Receive cruise and dive plans and daily ship updates
- Data, video, and samples available to all after cruise
- Annual reports in a supplement published by the Oceanography Society



<https://tos.org/oceanography/issue/volume-31-issue-01-supplement>



Scientists Ashore: join in the discussion & provide AOIs for mapping

Ship Charters: Use *Nautilus* for your exploration project

www.oceanexplorationtrust.org

Watch at: www.nautiluslive.org

