

4-2011

## 2010 Western Pacific bathymetry mapping for U.S. Law of the Sea

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### Recommended Citation

Gardner, James V. and Armstrong, Andy, "2010 Western Pacific bathymetry mapping for U.S. Law of the Sea" (2011). *U.S. Hydrographic Conference*. 737.

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# 2010 Western Pacific bathymetry mapping for U.S. LAW OF THE SEA

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## 2010 Western Pacific bathymetry mapping for U.S. Law of the Sea

The University of New Hampshire's Center for Coastal and Ocean Mapping-Joint Hydrographic Center conducted three one-month cruises in the western Pacific in 2010 to support the U.S. Law of the Sea efforts. Two months were spent mapping the entire Mariana Trench and the southern Mariana Trough aboard the USNS Sumner as well as one month mapping the northern end of the Line Island chain in the vicinity of Kingman Reef and Palmyra Atoll aboard the R/V Kilo Moana. All three cruises utilized the newest generation of the 12-kHz Kongsberg Maritime EM122 multibeam echosounder.

The objective for mapping the Mariana Trench was to define the details of subducting seamounts that form a "bridge" spanning across the trench from the inner wall on the west to the Pacific Plate on the east. Four bridges were mapped along the extent of the trench that involve seamounts, guyots (flat-topped seamounts) and ridges that are actively being fractured by faults created as the Pacific Plate flexes downward into the trench axis.

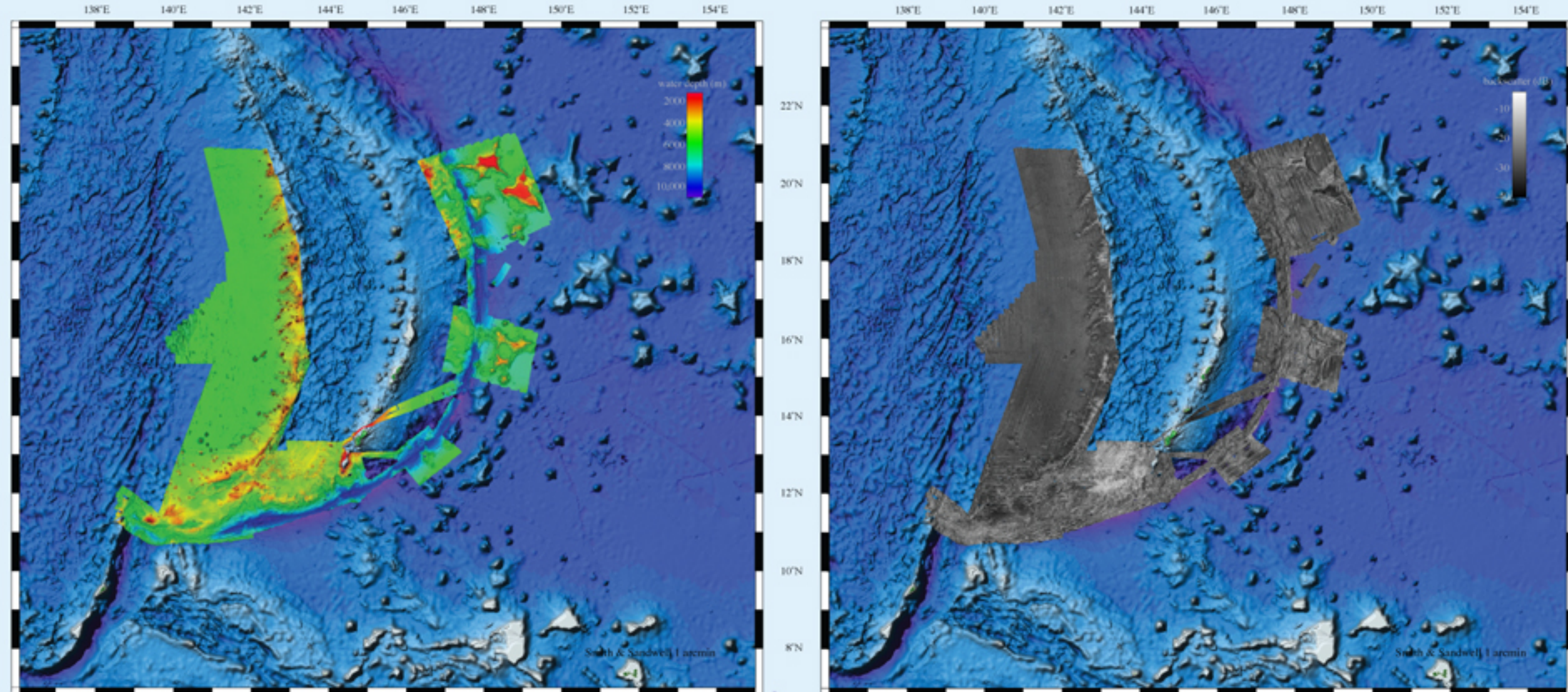
The deepest depth recorded is 10,994 m, somewhat shallower than the reported deepest depth. Because quality control was assured by collecting XBT casts at a minimum of one every 6 hr to correct the refracted raytraced depths, we believe our maximum depth is the most precise.

The Mariana Trough is an area of backarc spreading that lies between the Mariana Arc and the West Mariana Ridge (an area mapped by us in 2006 and 2007). The Mariana Trough is an area of massive outpourings of basalt that form two E-W curvilinear ridges broken by a NE-SW seafloor-spreading fabric.

The northern portion of the Line Island chain was mapped to determine location of the base-of-the-slope zone. A total area of 107,435 km<sup>2</sup> was mapped on the northern ridge and southern and northwestern adjacent basin. The data demonstrate that the ridge from which Kingman Reef and Palmyra Atoll are built upon has undergone a significant amount of erosion. Large landslides have eroded the flanks of the ridge and a major network of channels funnel sediment from the ridge out onto the adjacent basin floor.

The data from all three cruises, along with images of the data, are publicly available at [http://ccom.unh.edu/law\\_of\\_the\\_sea.html](http://ccom.unh.edu/law_of_the_sea.html).

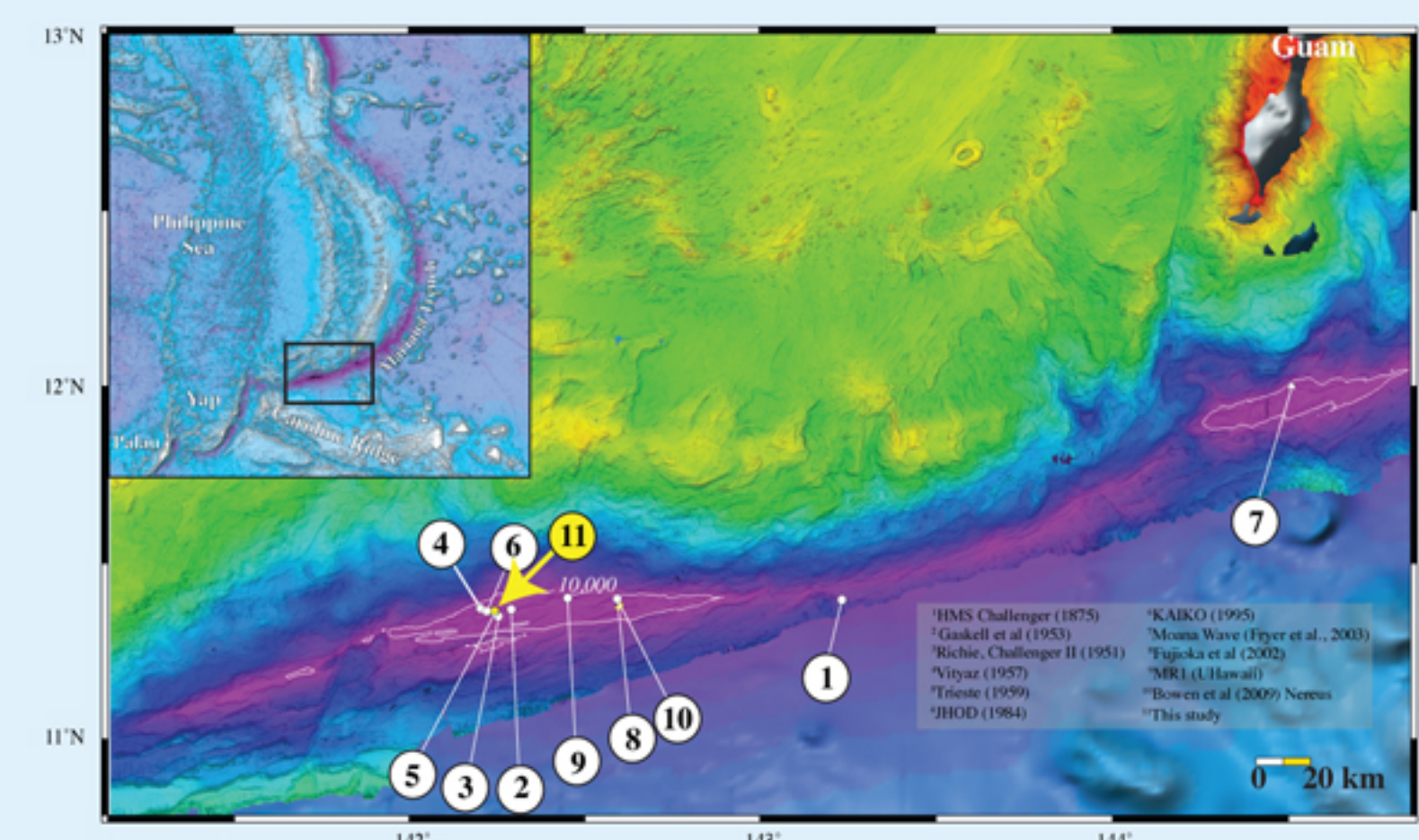
## MARIANA TRENCH, MARIANA TROUGH & WEST MARIANA RIDGE



Multibeam bathymetry of the Mariana area

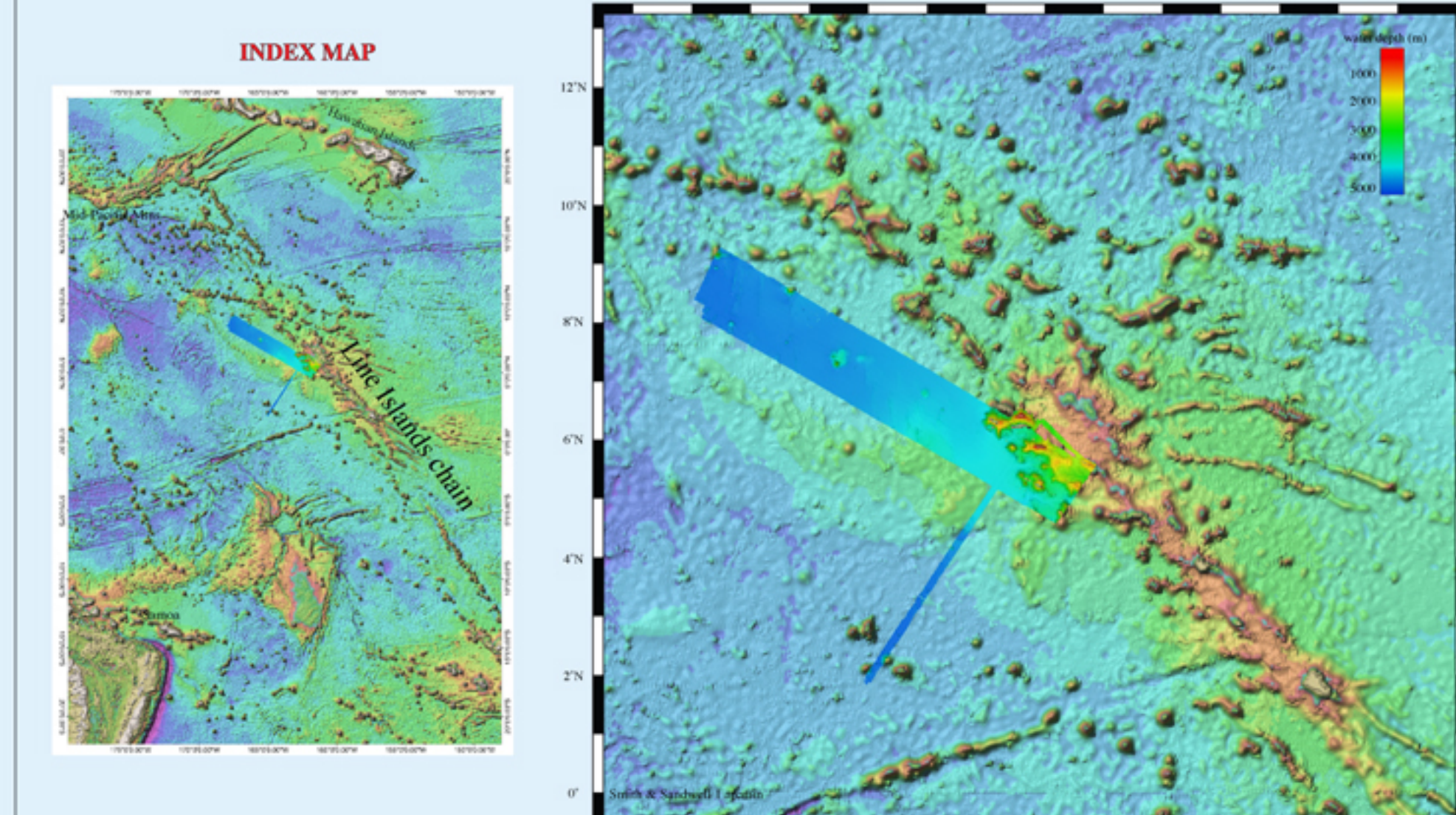
Multibeam acoustic backscatter of the Mariana area

## Where is the deepest depth of Challenger Deep and how deep IS it?



The deepest depth measured in the Challenger Deep of the Mariana Trench was made in 2010 and is 10,994 m. This is the deepest documented depth of the trench, although 11,034 m was reported by Taira et al. (2004) from the RV Vityaz' 1957 cruise.

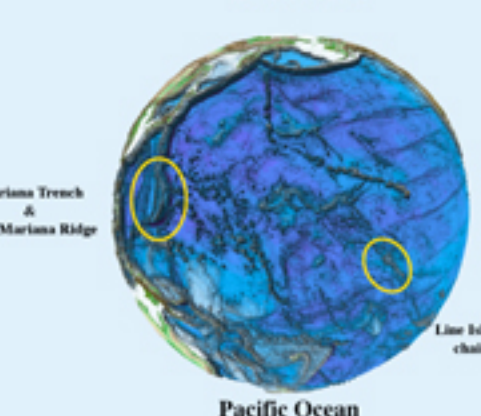
## NORTHERN LINE ISLANDS CHAIN (KINGMAN REEF & PALMYRA ATOLL)



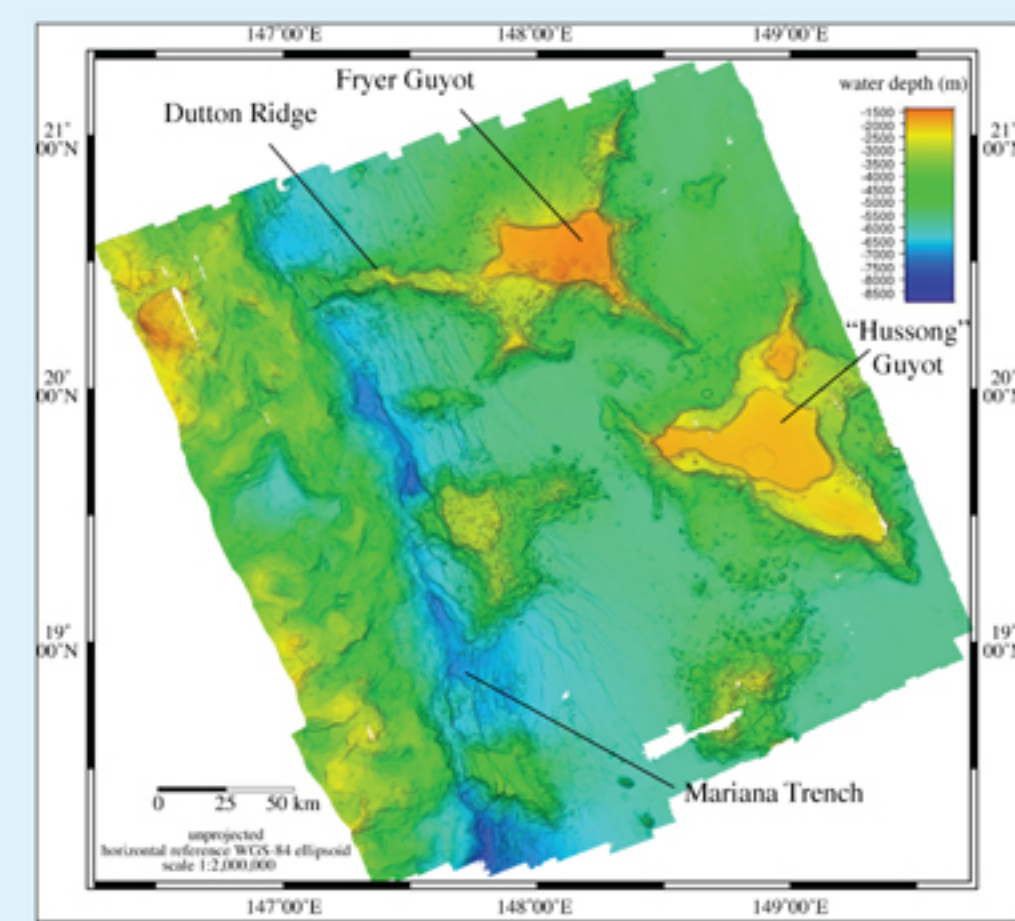
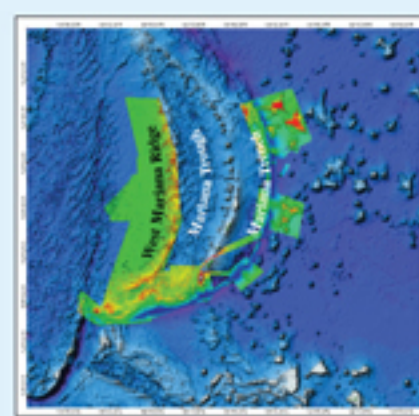
INDEX MAP

Multibeam bathymetry of the northern Line Islands chain

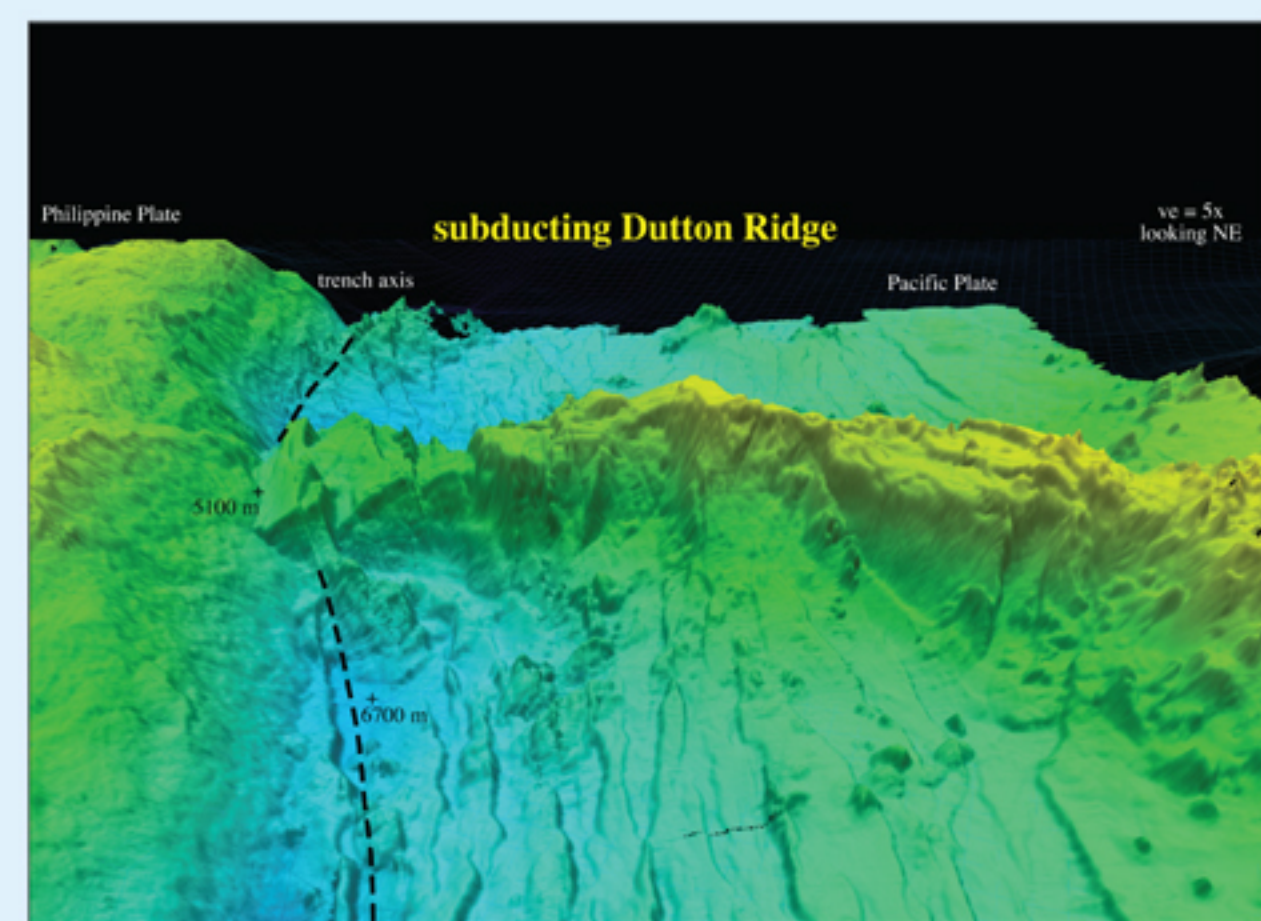
## LOCATIONS



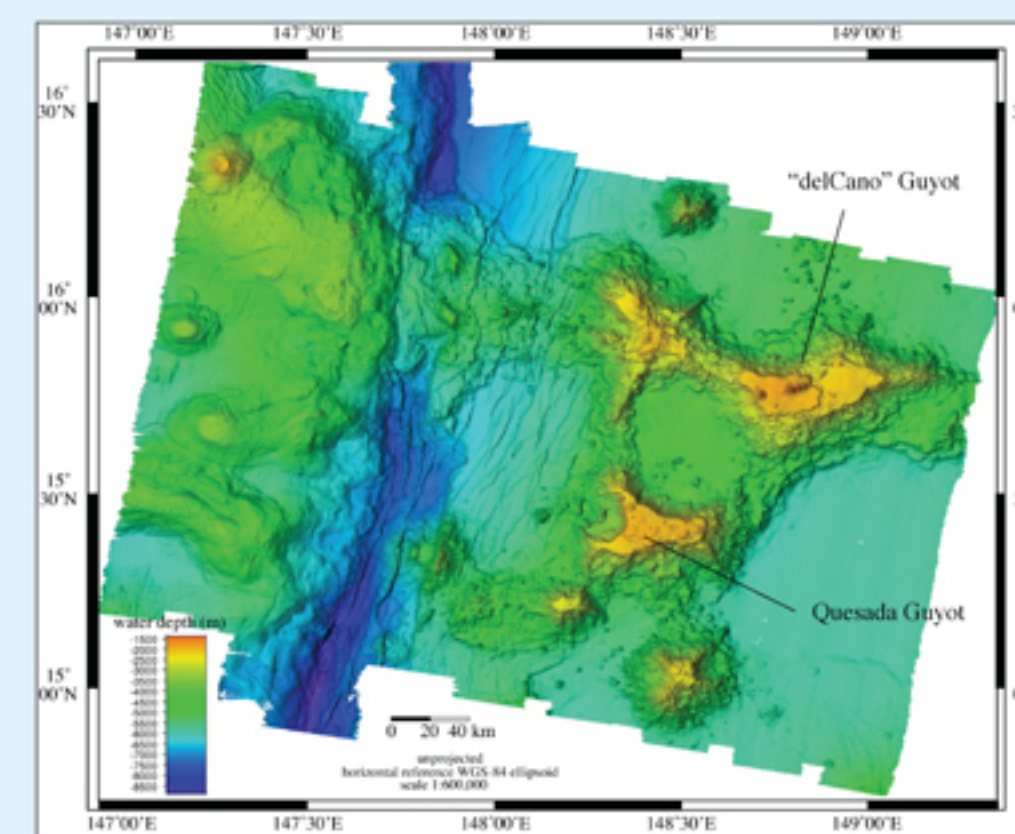
## INDEX MAP



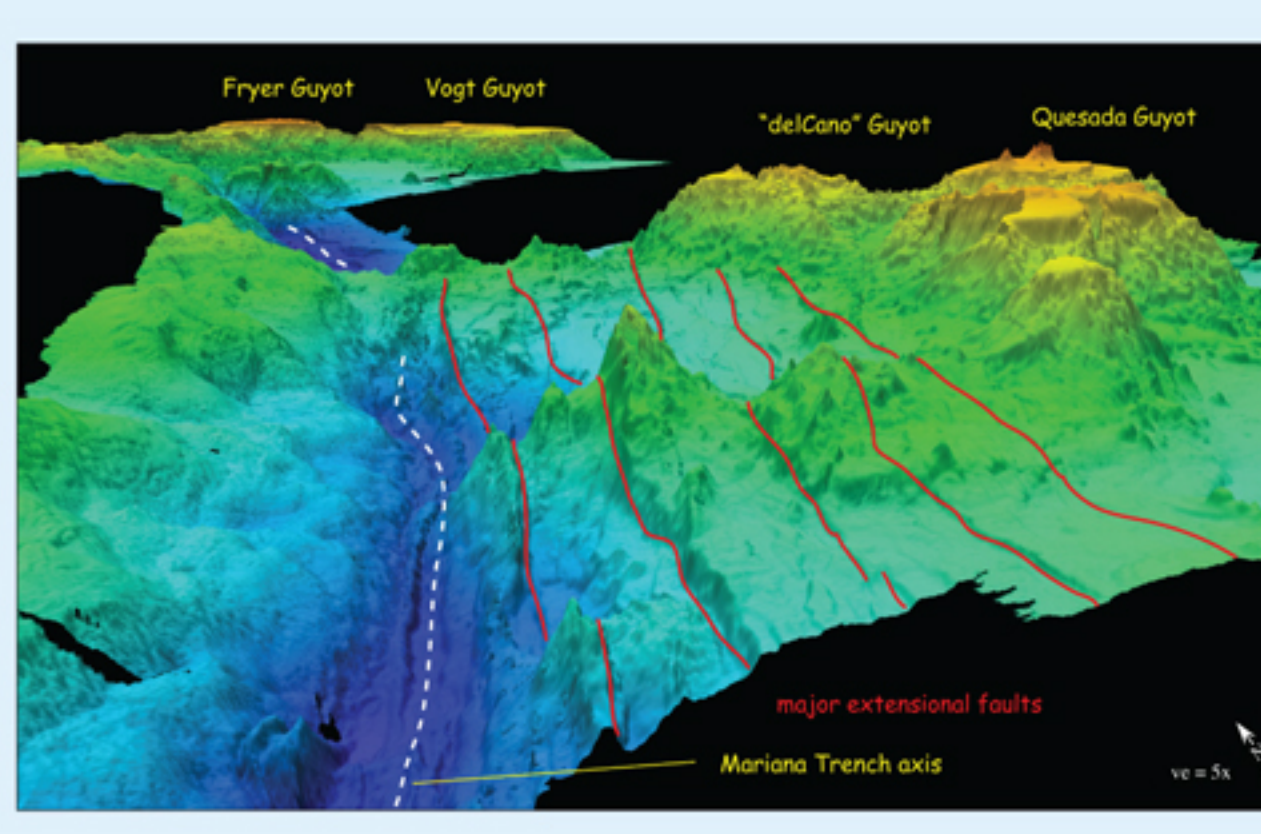
1. Map view of guyots of the northern-most section of the Magellan Seamount chain. Dutton Ridge is in the process of being subducted into the Mariana Trench.



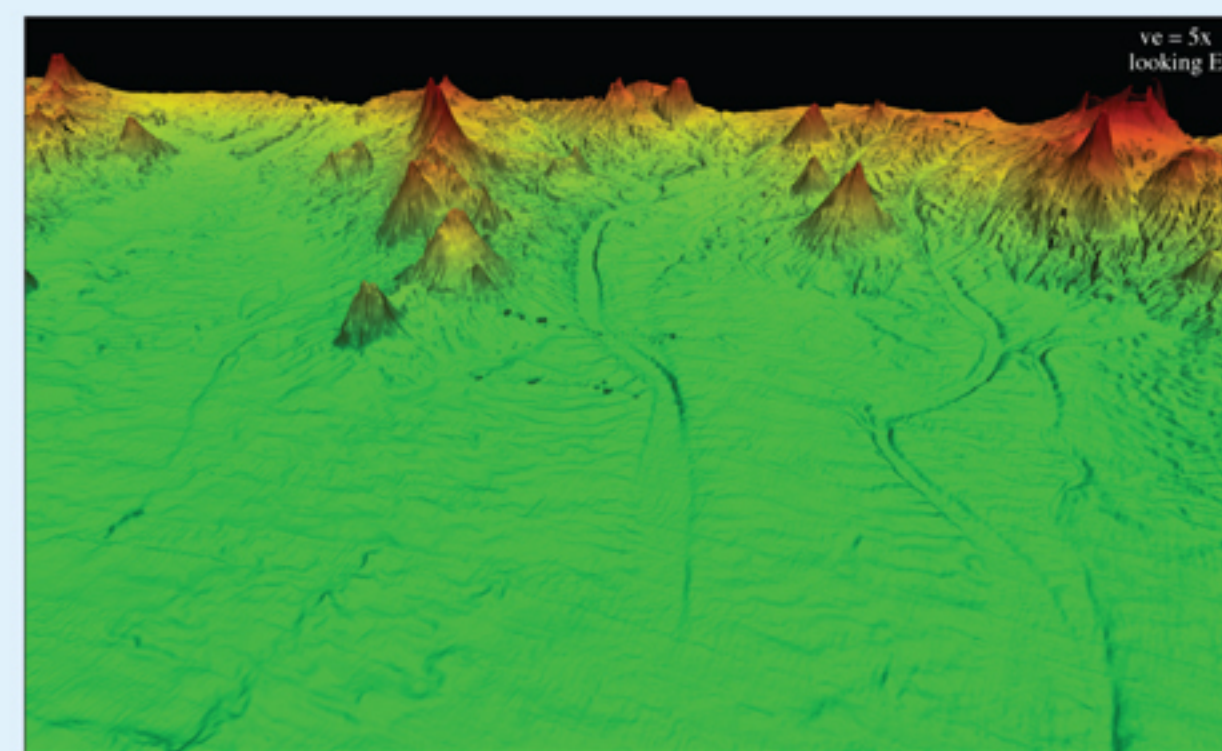
2. Perspective view of Dutton Ridge being subducted into the Mariana Trench. Note the destruction of Dutton Ridge caused by the extensional faulting as the rigid Pacific Plate is bent downward into the trench. Black dashed line is axis of the Mariana Trench.



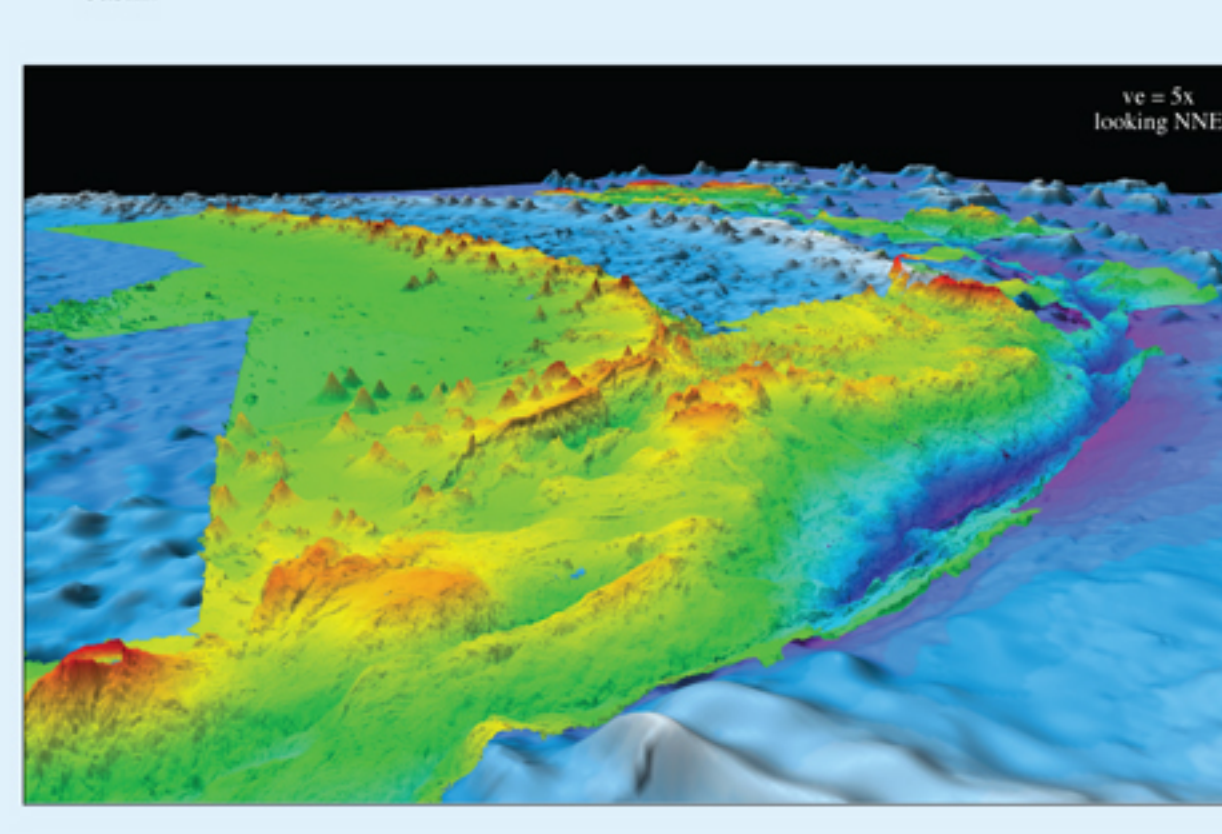
3. Map view of central region of the Mariana Trench showing two guyots of the northern-most section of the Magellan Seamount chain. An unnamed ridge is in the process of being subducted into the Mariana Trench.



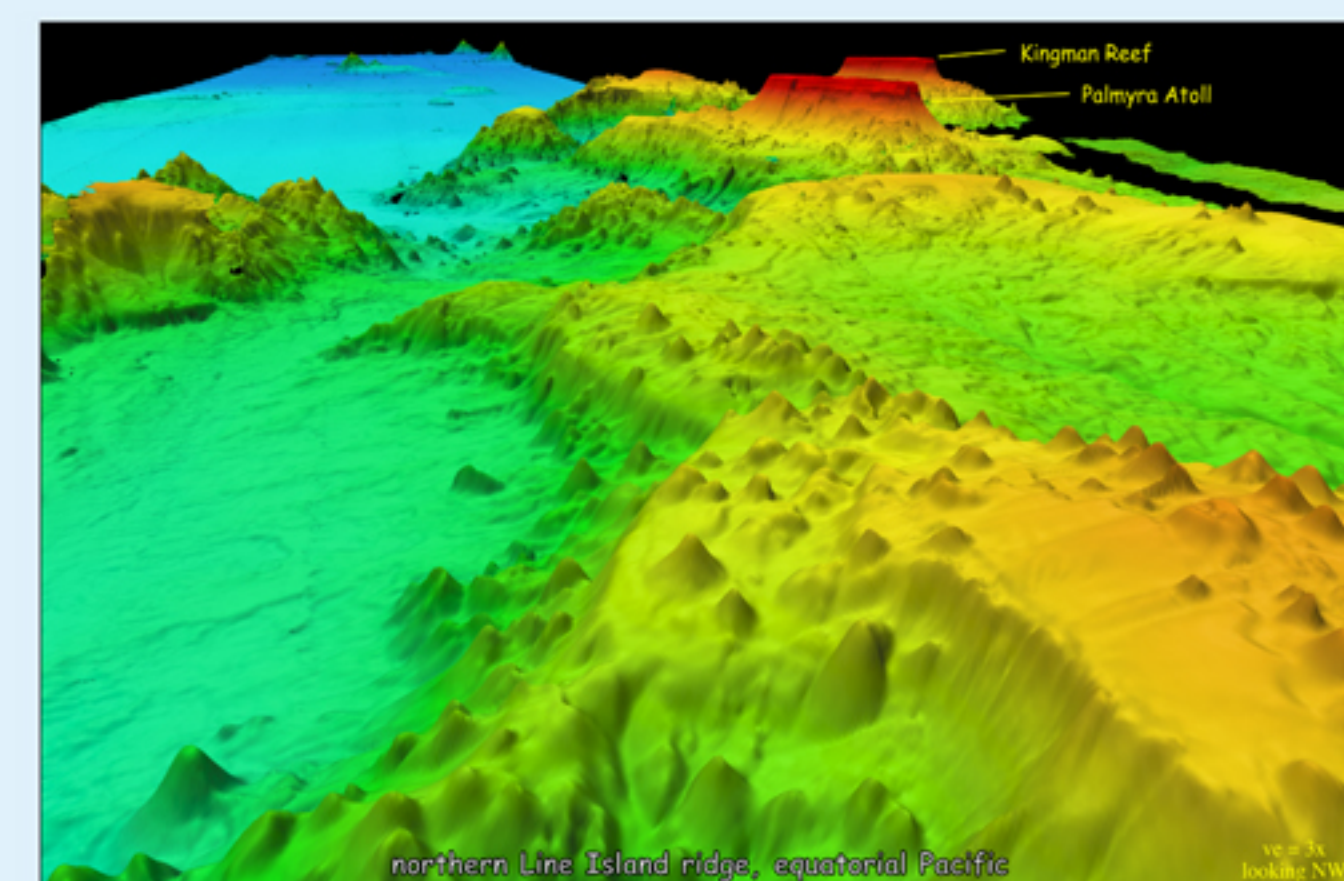
4. Perspective view of central region of the Mariana Trench showing the traces of the extensional faults. White dashed line is axis of the Mariana Trench



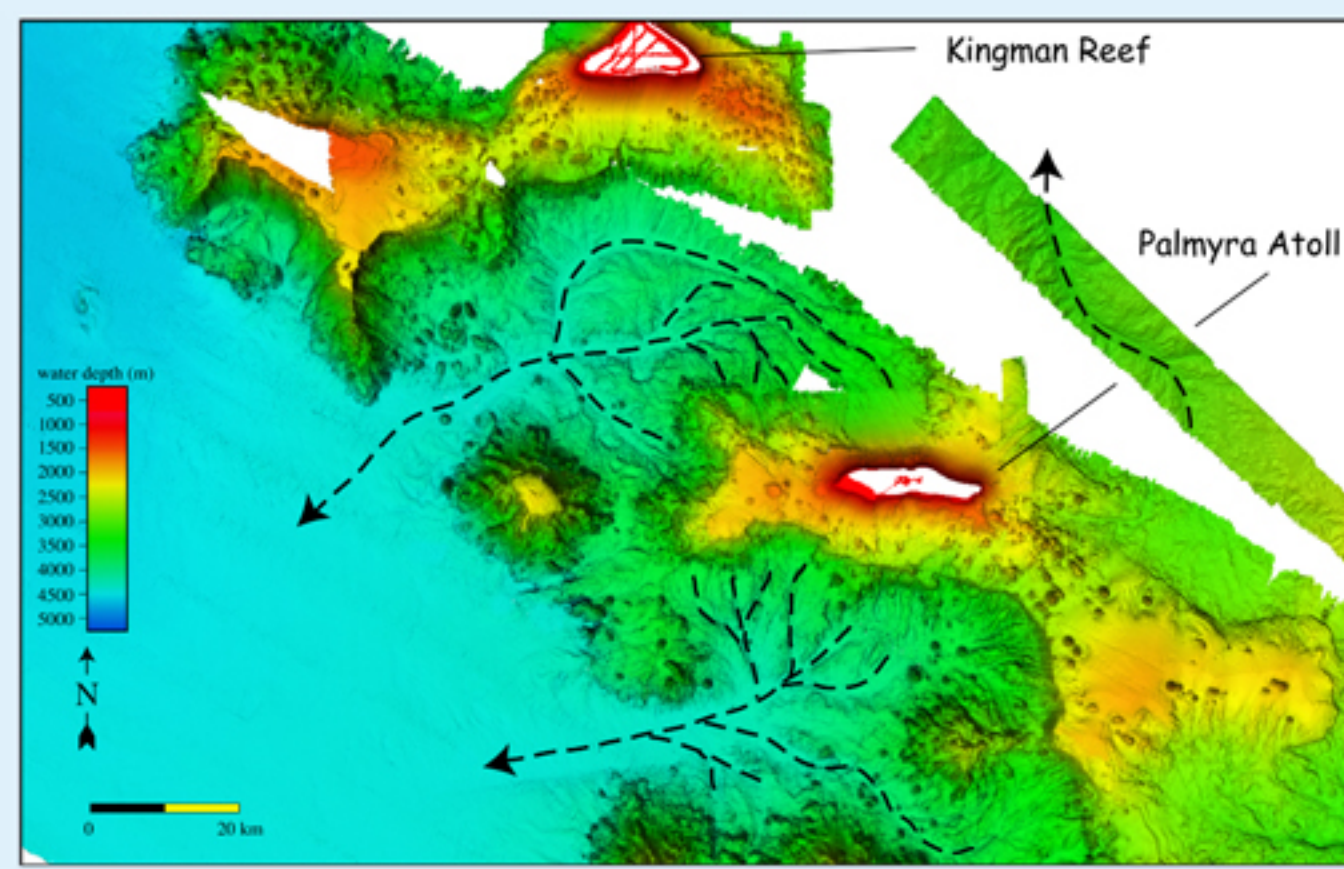
5. Perspective view of a central section of the West Mariana Ridge showing extensive submarine channels that funnel volcanoclastic sediment from the eroding volcanoes to the basin.



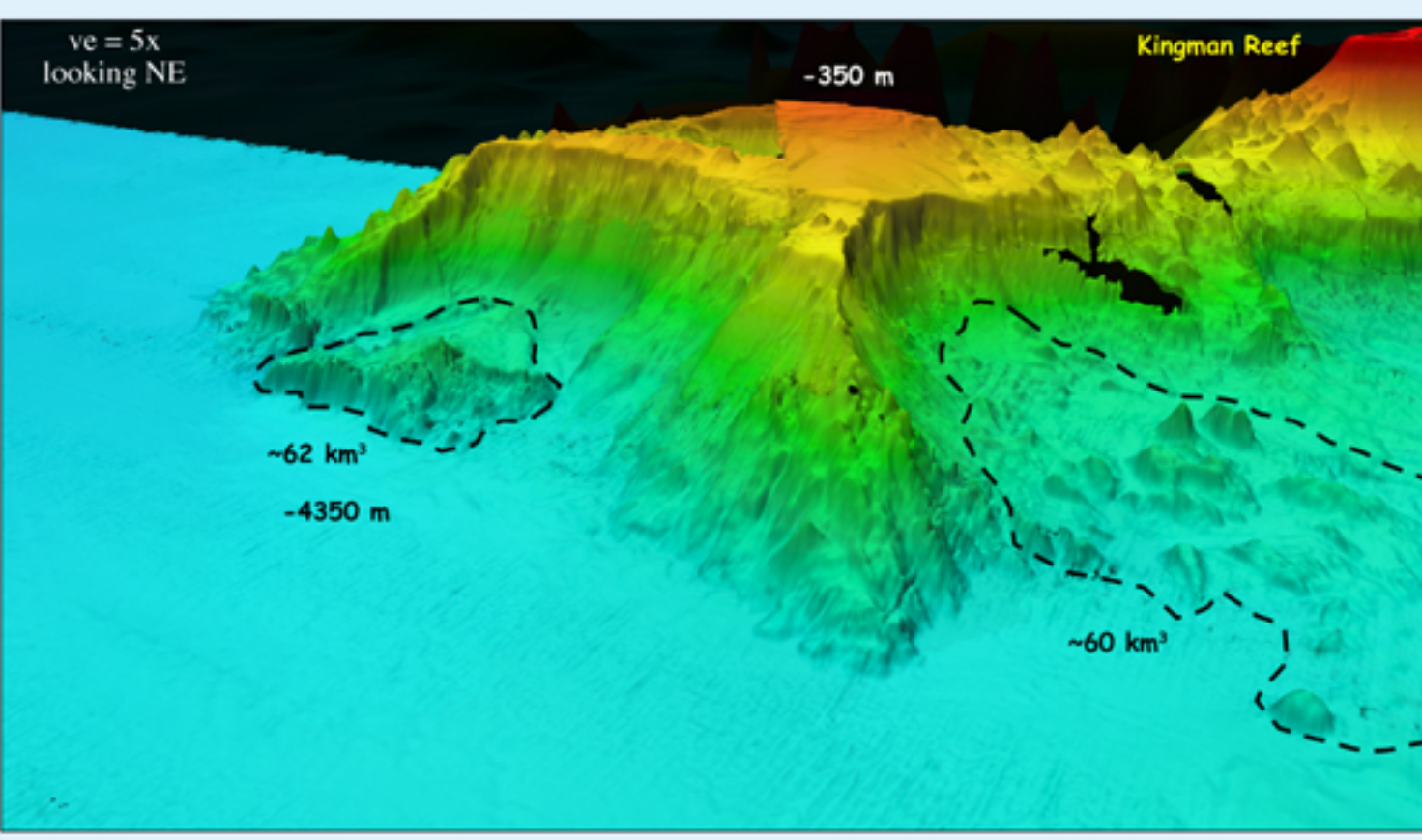
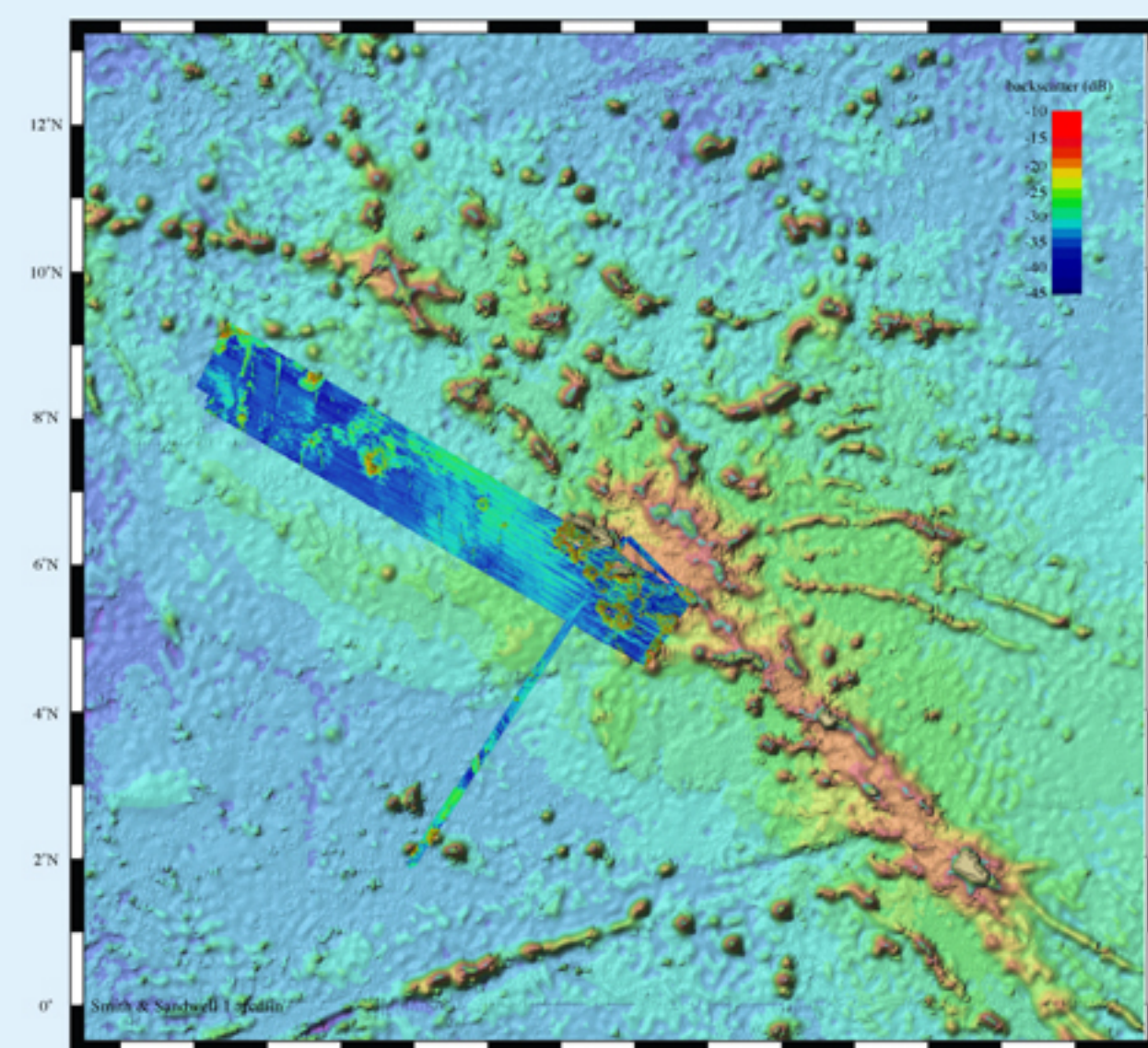
6. Perspective view of Mariana Trench and West Mariana Ridge showing a field of isolated volcanoes in the left-center of the view.



7. Perspective view of the northern region of the Line Island chain showing the extensive Line Island platform with Kingman Reef and Palmyra Atoll rising to sea level. Note the deep flat basin to the northwest.



8. Map view of northern region of Line Islands platform with Kingman Reef and Palmyra Atoll. Black dashed lines delineate sediment-transport paths from the eroding Line Islands platform to the adjacent basin. Kingman Reef and Palmyra Atoll DTMs from NOAA's Pacific Islands Benthic Habitat Mapping Center.



9. Perspective view of the northern Line Island platform. The black dashed lines outline large mass failures from the edges of the platform. The entire northern section of the platform shows similar erosion.