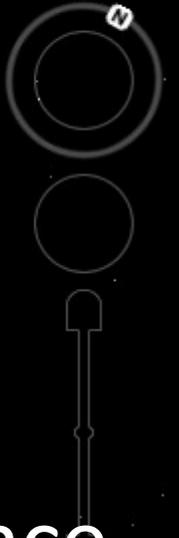


# EXPLORING THE DEEP SEA



Prof Kerry Howell

Image credit NOAA



75%

The ocean covers three quarters of the Earth's surface

Image IBCAO  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image © 2013 TerraMetrics

Google earth

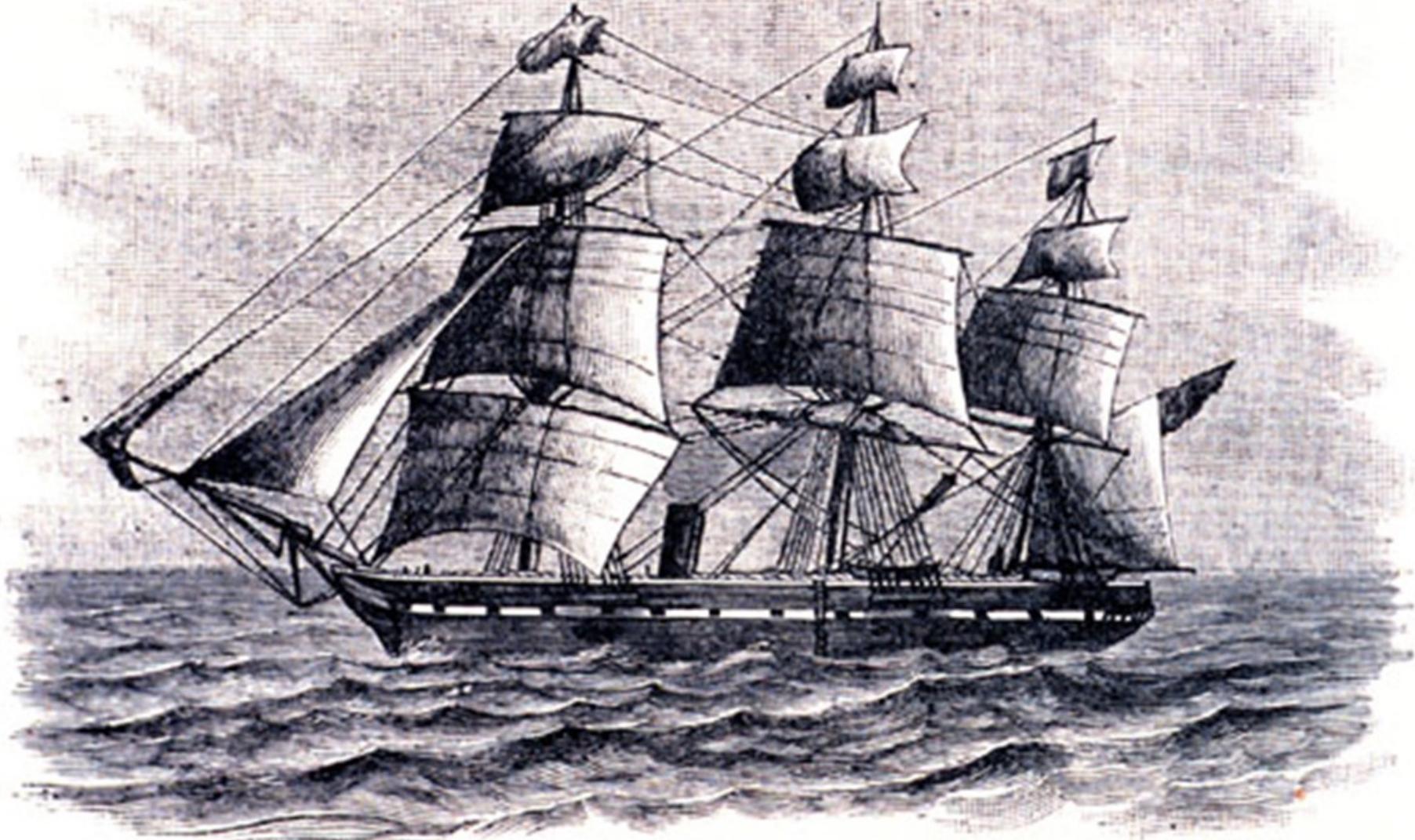
Eve alt 14822.77 km 

The deep-sea is the area that lies beyond the continental shelf





# The Challenger Expedition 1872–1876



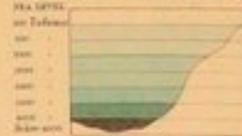
H.M.S. CHALLENGER PREPARING TO SOUND, 1872.

# The Challenger Expedition 1872–1876



# BATHYMETRICAL CHART OF THE OCEANS SHOWING THE "DEEPS" According to Sir John Murray

REFERENCE TO COLOURING



Track of HMS Challenger shown thus



FIG. 17.—The Dredging and Sounding Arrangements on board the 'Challenger.'

# Our view of the deep sea

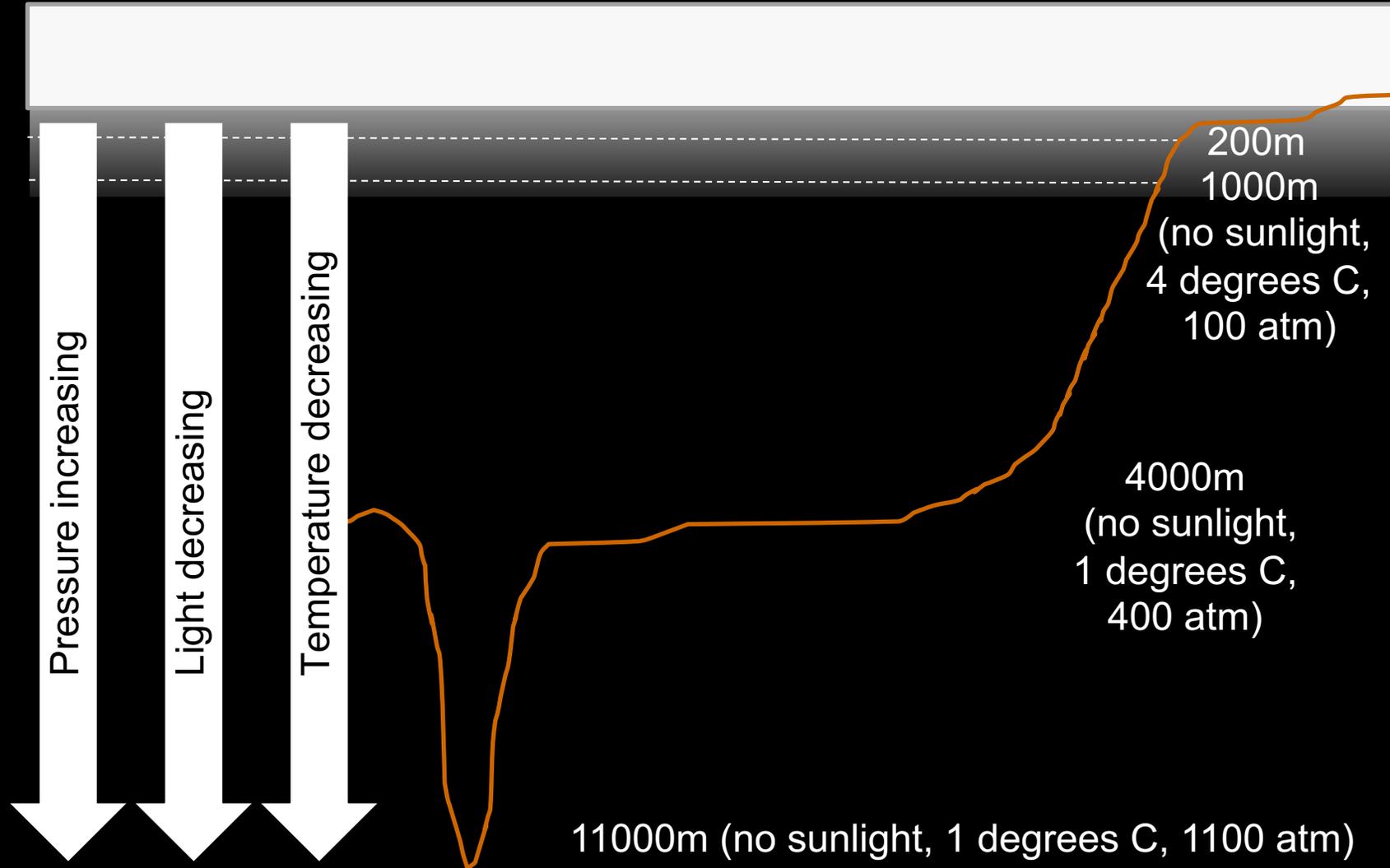


FIG. 17.—The Dredging and Sounding Arrangements on board the 'Challenger.'

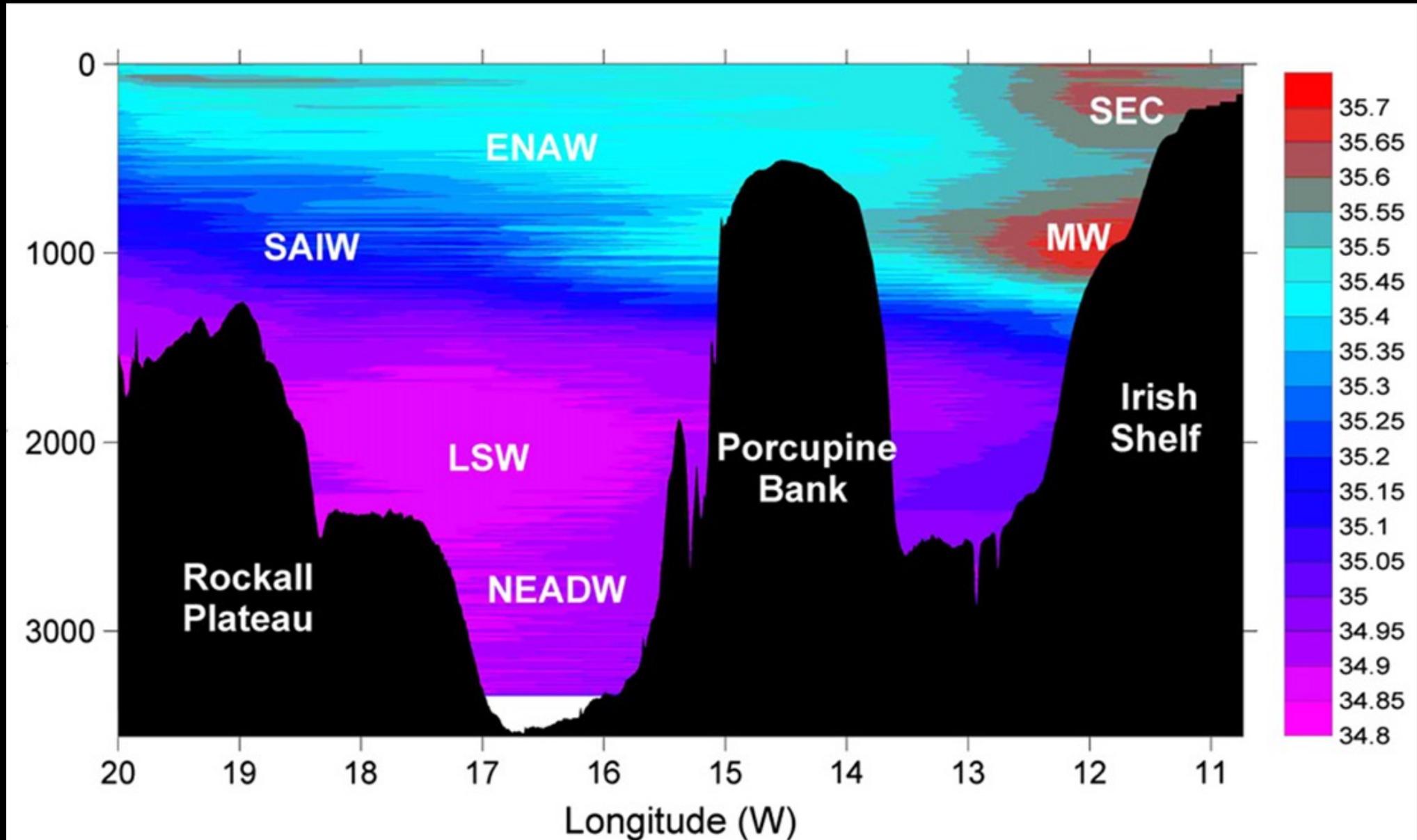


Image credit: Rob Larter (British Antarctic Survey)

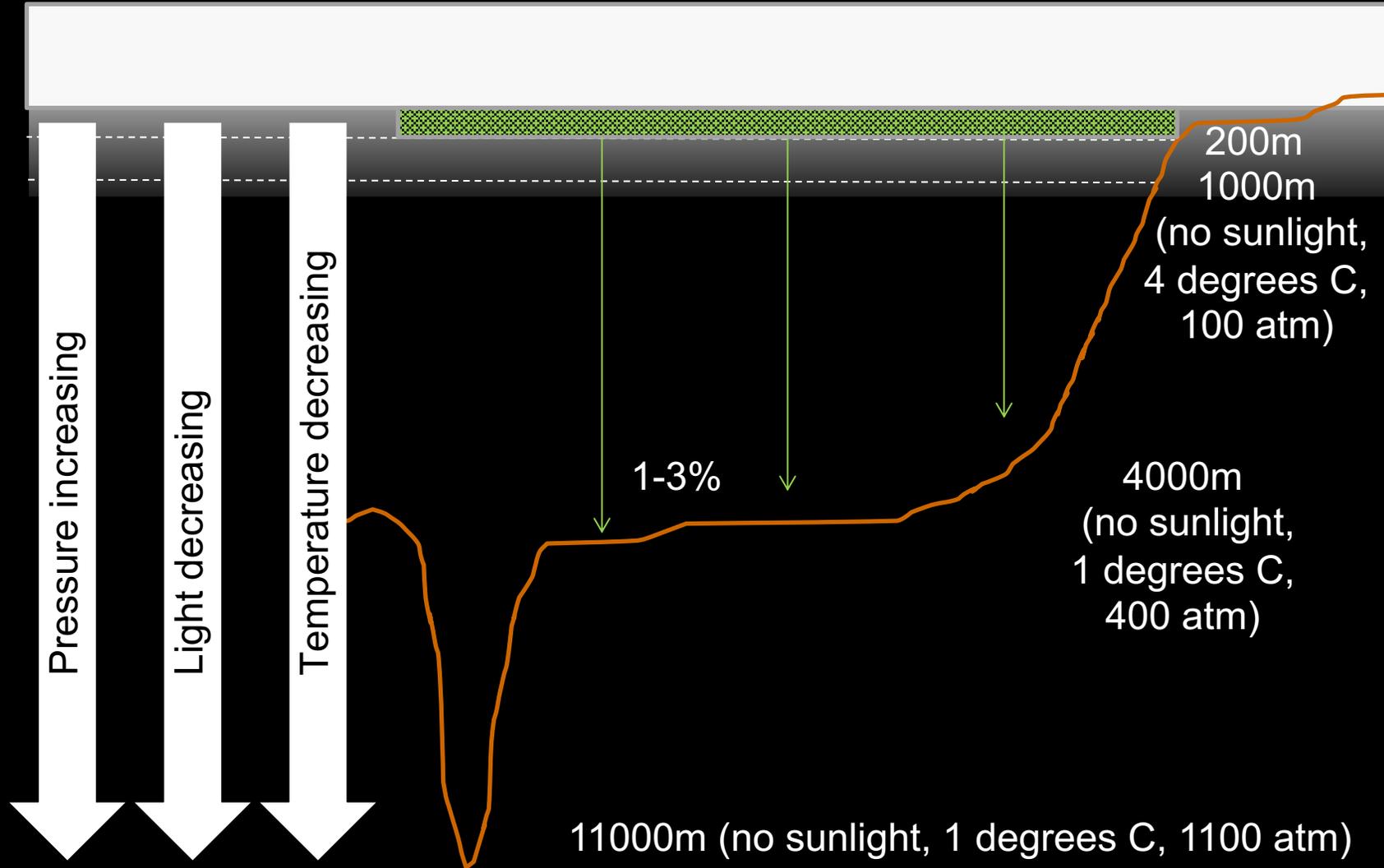
# The deep-sea environment



# water mass structure



# The deep-sea environment



# The fauna change with depth

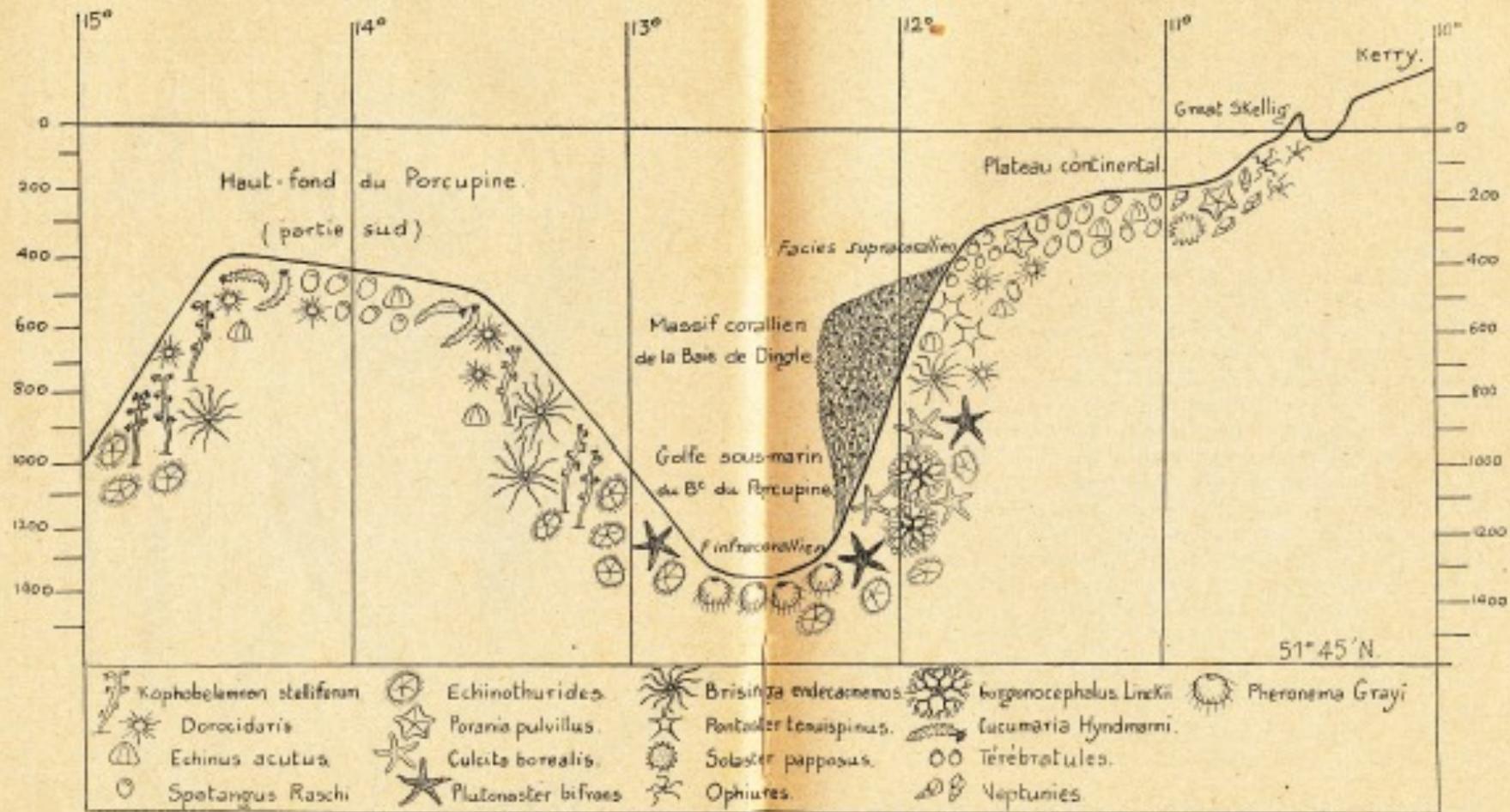


Fig. 47. — Section du secteur du S. W. de l'Irlande le long de 51°45' N. (1)

(1) (28 lies de Culcita borealis, lire : Porastinocephala tétrépède)

# Our view of the deep sea



FIG. 17.—The Dredging and Sounding Arrangements on board the 'Challenger.'



Image credit: Rob Larter (British Antarctic Survey)

Image credit: Andrew Baker, BBC News.



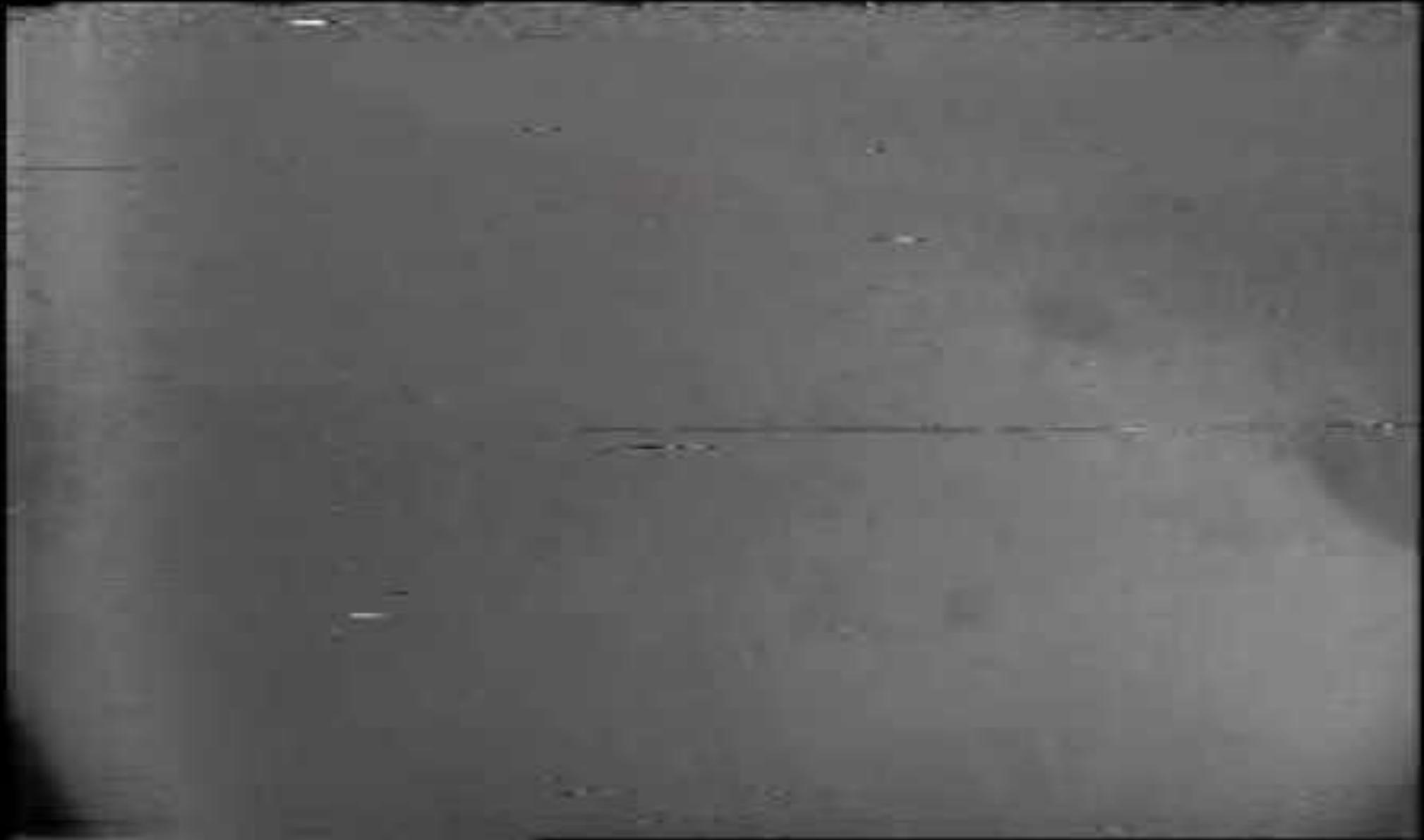
Equivalent of towing a bucket from a hot air balloon and basing your understanding of London on what you retain in the bucket!

# The Pisces III submersible



Image credit: YouTube, Lophelia.org

Early footage from a manned submersible (1973)



What was John Wilson looking at?



Image courtesy of Veerle Huvenne NOCS

## The discovery of hydrothermal vents (1977)



Video courtesy of Jon Copley, Southampton University.

# Remotely Operated Vehicles - ROVs



UK's ISIS ROV



Ireland's Holland I ROV



# Observing animals in their natural habitat



Taking an animal sample with the Holland I robot



# Undertaking experiments with the Jason robot





Image credit: NASA's Scientific Visualization Studio

# Mapping the ocean floor



100% mapped at 100m resolution



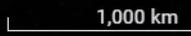
100% mapped at 100m resolution



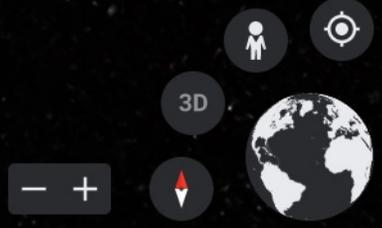
~20% mapped at <1km resolution



Google 100% Imagery date: 12/14/15-newer Data SIO, NOAA, U.S. Navy, NGA, GEBCO Landsat / Copernicus IBCAO U.S. Geological Survey INEG...

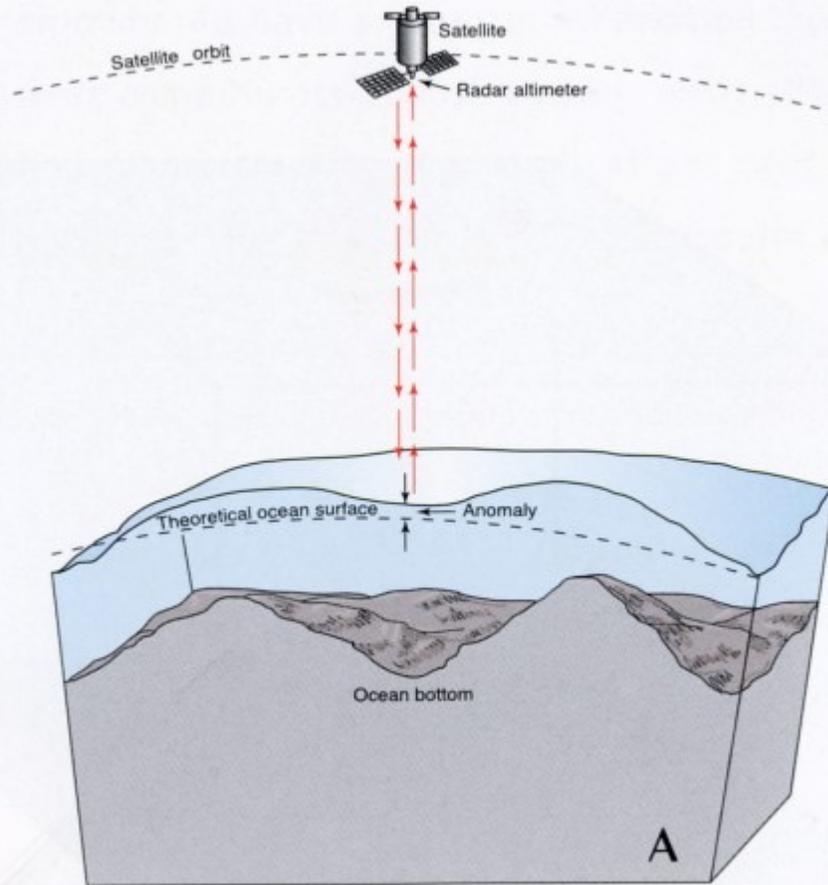


Camera: 10,029 km 42.940133°N 31.021886°W



# Mapping the ocean floor

Image credit: <https://www.gebco.net>



## Satellite altimetry

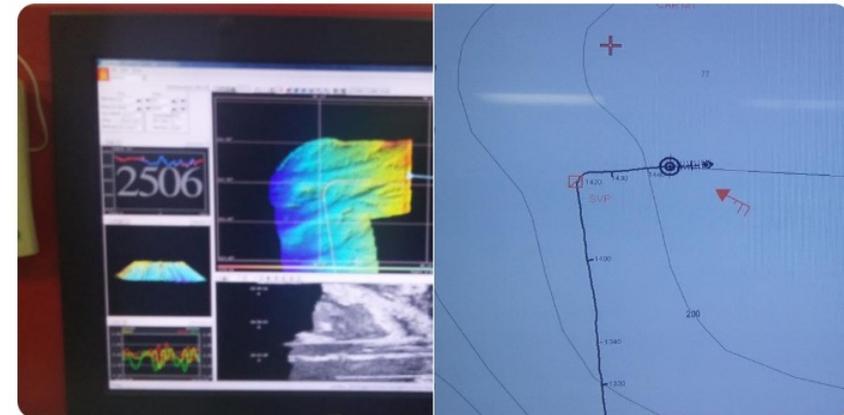


**Kerry Howell**

@DeepSeaEcol

Follow

Just to demonstrate how inaccurate our maps of the seabed can be we are currently mapping Cardino Seamount in St Helena's EEZ and the seafloor is 2000m deeper than our chart says it should be! [@seabed2030](#) [#DY100](#)

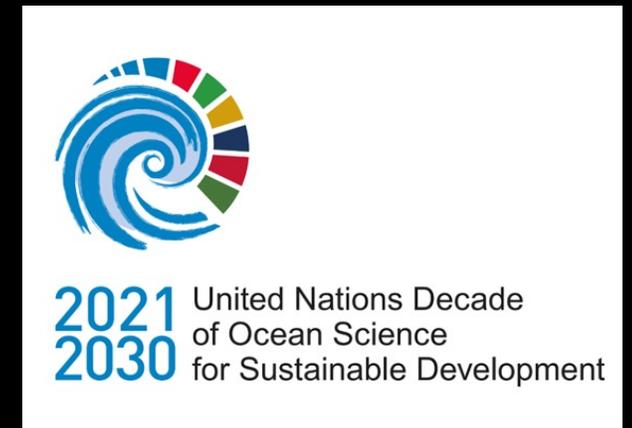
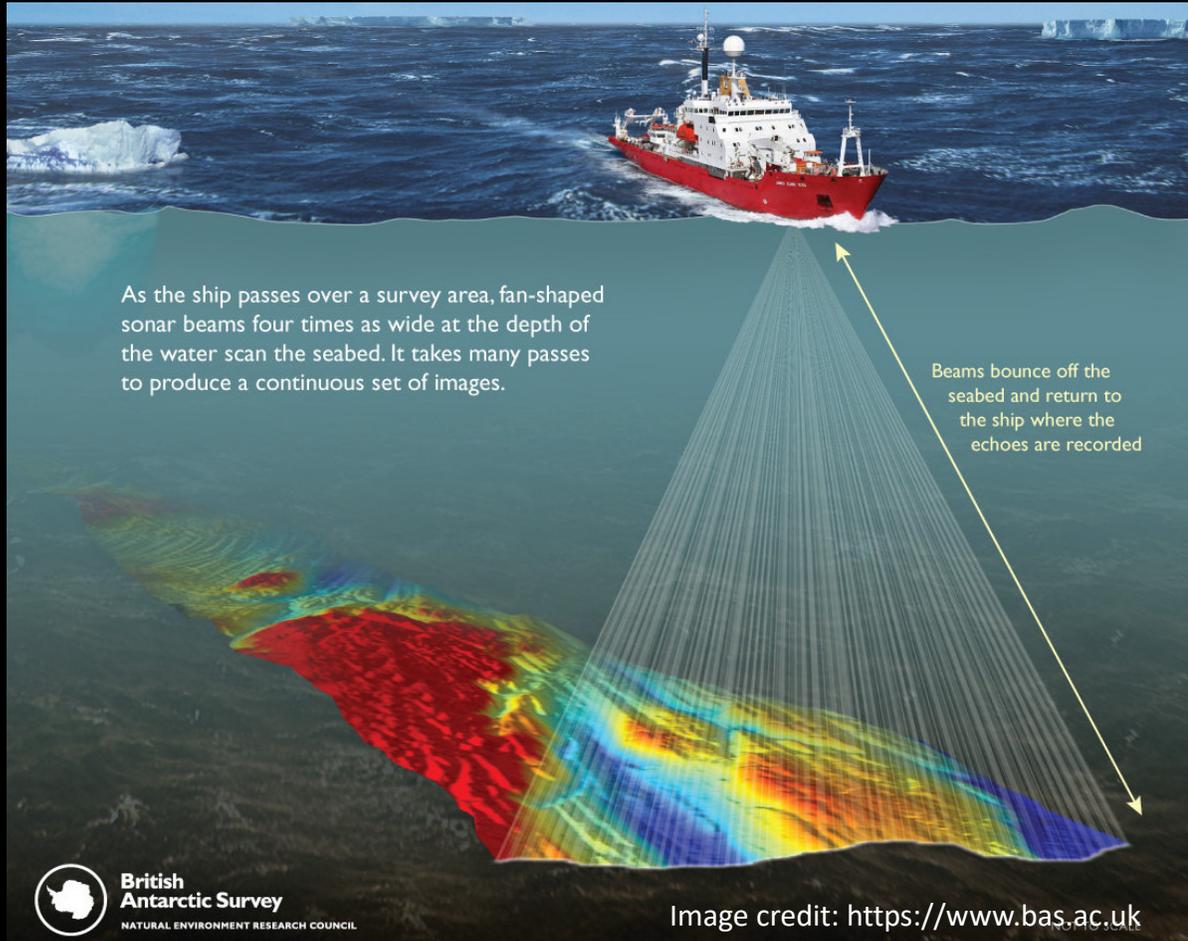


7:47 AM - 10 Apr 2019

17 Retweets 53 Likes

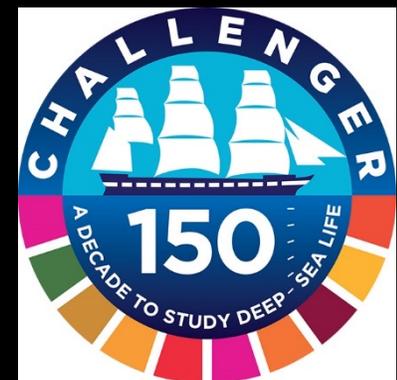


# Mapping the ocean floor



Multibeam survey

much less than 0.001  
percent of the total deep  
sea has been sampled



# The future of deep sea science?



Autonomous technology

# Big Data!



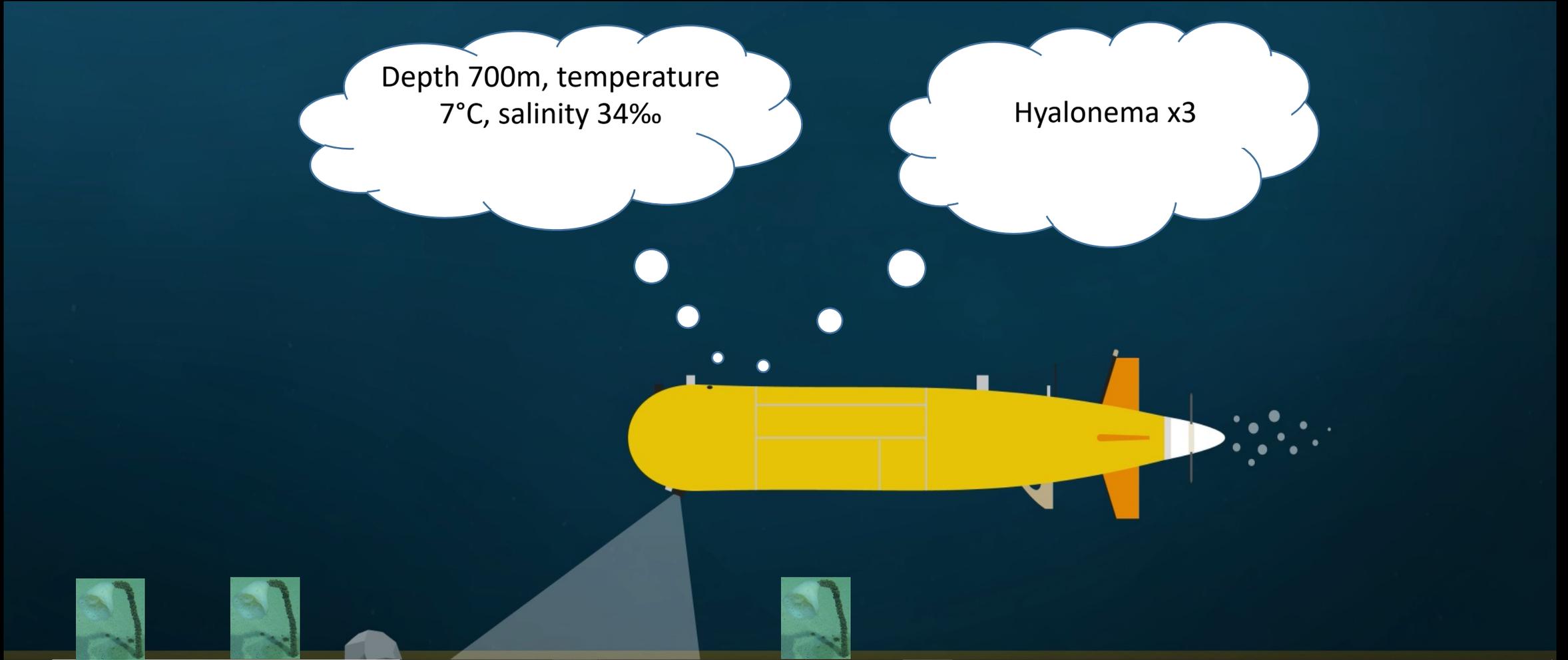


Computer vision to interpret vast datasets

This opens up a world of possibilities!

Depth 700m, temperature  
7°C, salinity 34‰

Hyalonema x3



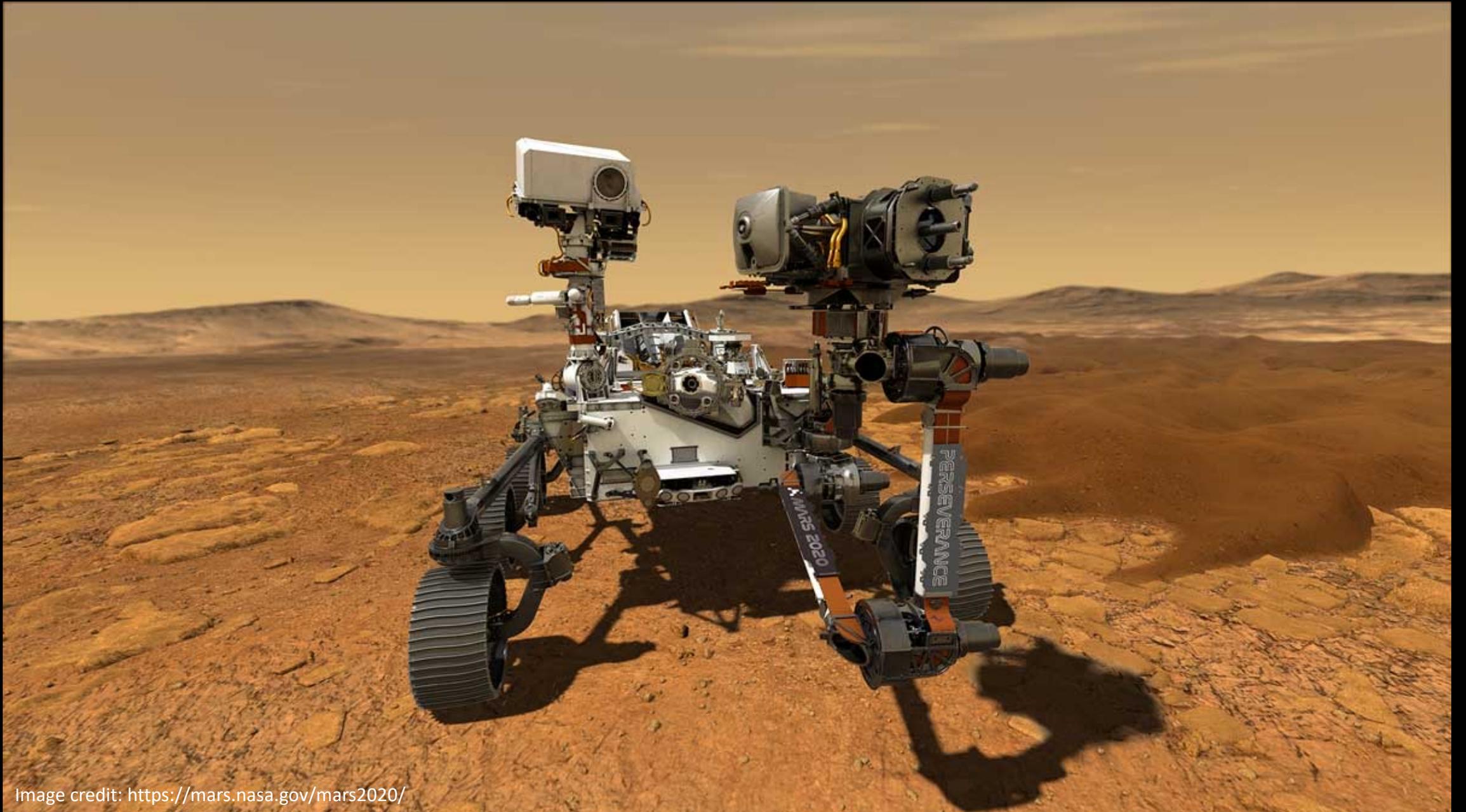
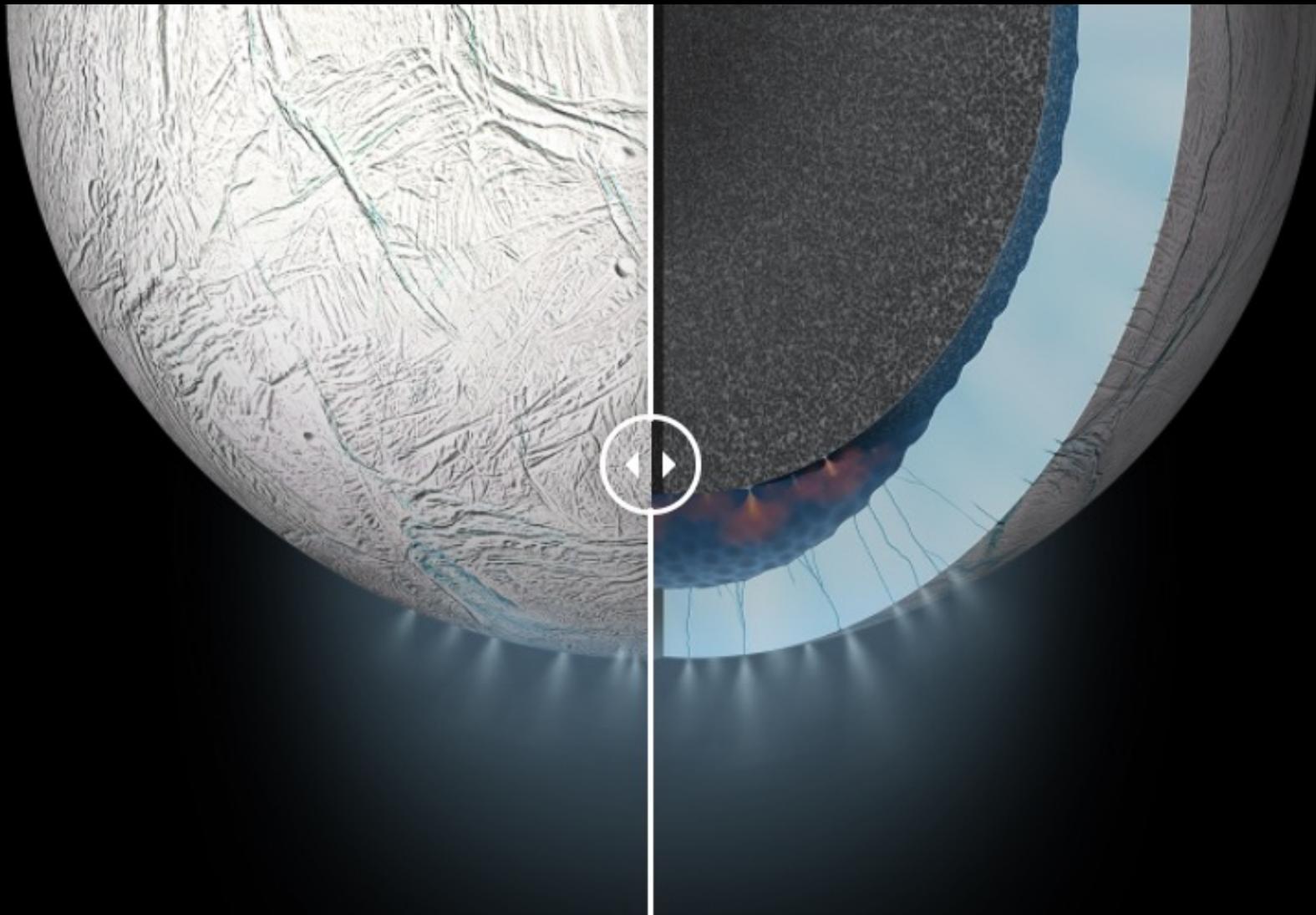


Image credit: <https://mars.nasa.gov/mars2020/>

We may well get it!



Thank you for  
your attention



UNIVERSITY OF  
PLYMOUTH  
School of Biological and  
Marine Sciences