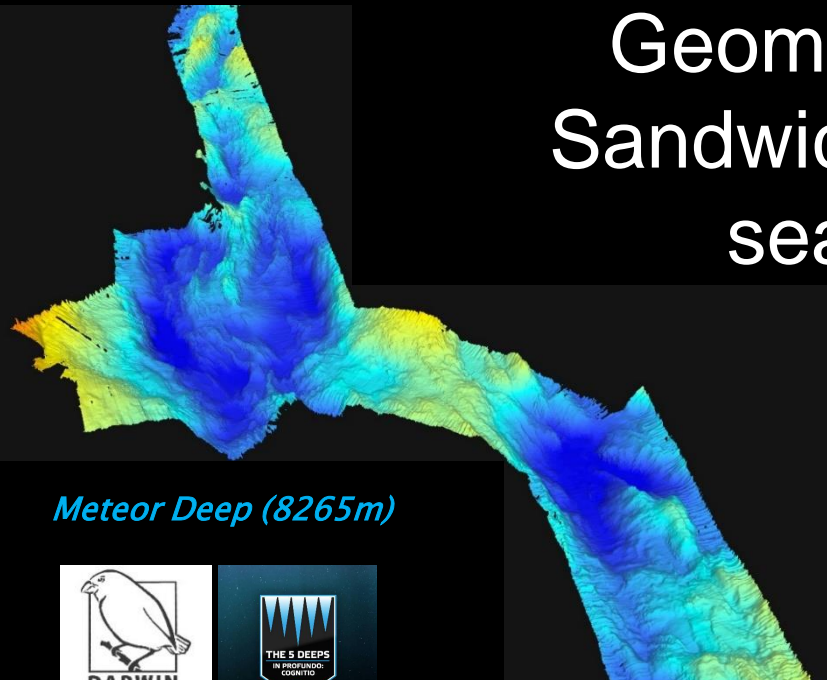




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Gateway to the Earth

Geomorphology of the South Sandwich Trench: escarpments, seamounts and deeps



Meteor Deep (8265m)



Heather Stewart

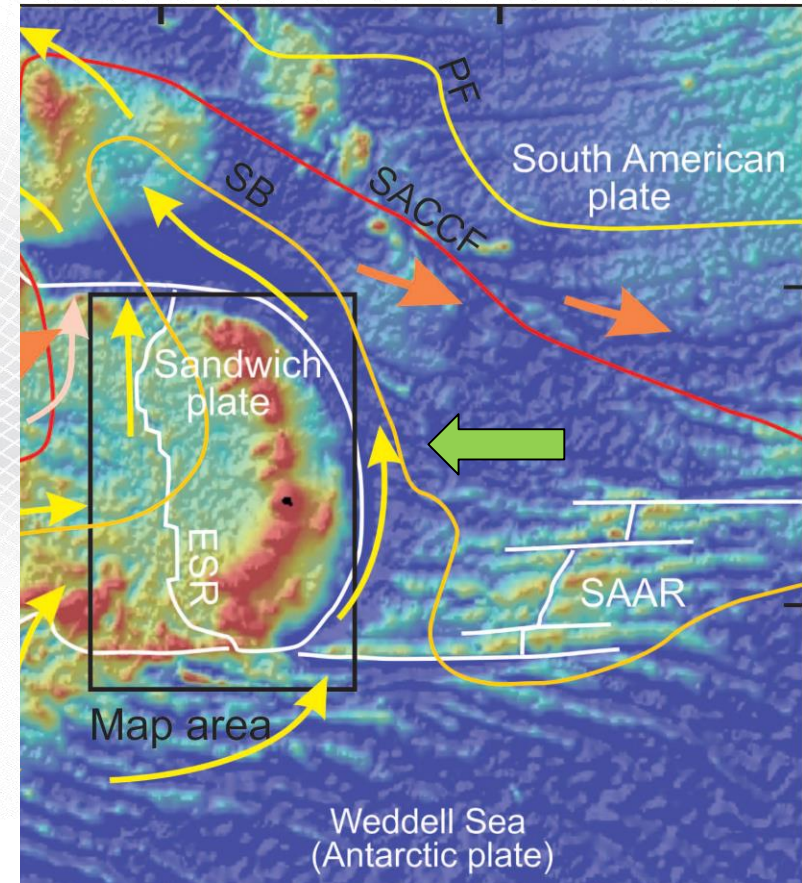
Dayton Dove, Cassie Bongiovanni

Alan Jamieson

What we knew before?

- SST is a large arcuate trench.
- South American Plate being subducted (65-78 mm / year) under the South Sandwich Plate.
- Even with recent bathymetric compilations (e.g. Leat et al. 2016; IBCSO) little accurate bathymetric information is known.
- This knowledge gap in biodiversity and geodiversity from trench area was highlighted in the recent MPA Review.

Fig. 1 in Leat et al. 2016 (*Antarct. Sci.* v28 pp293-303)

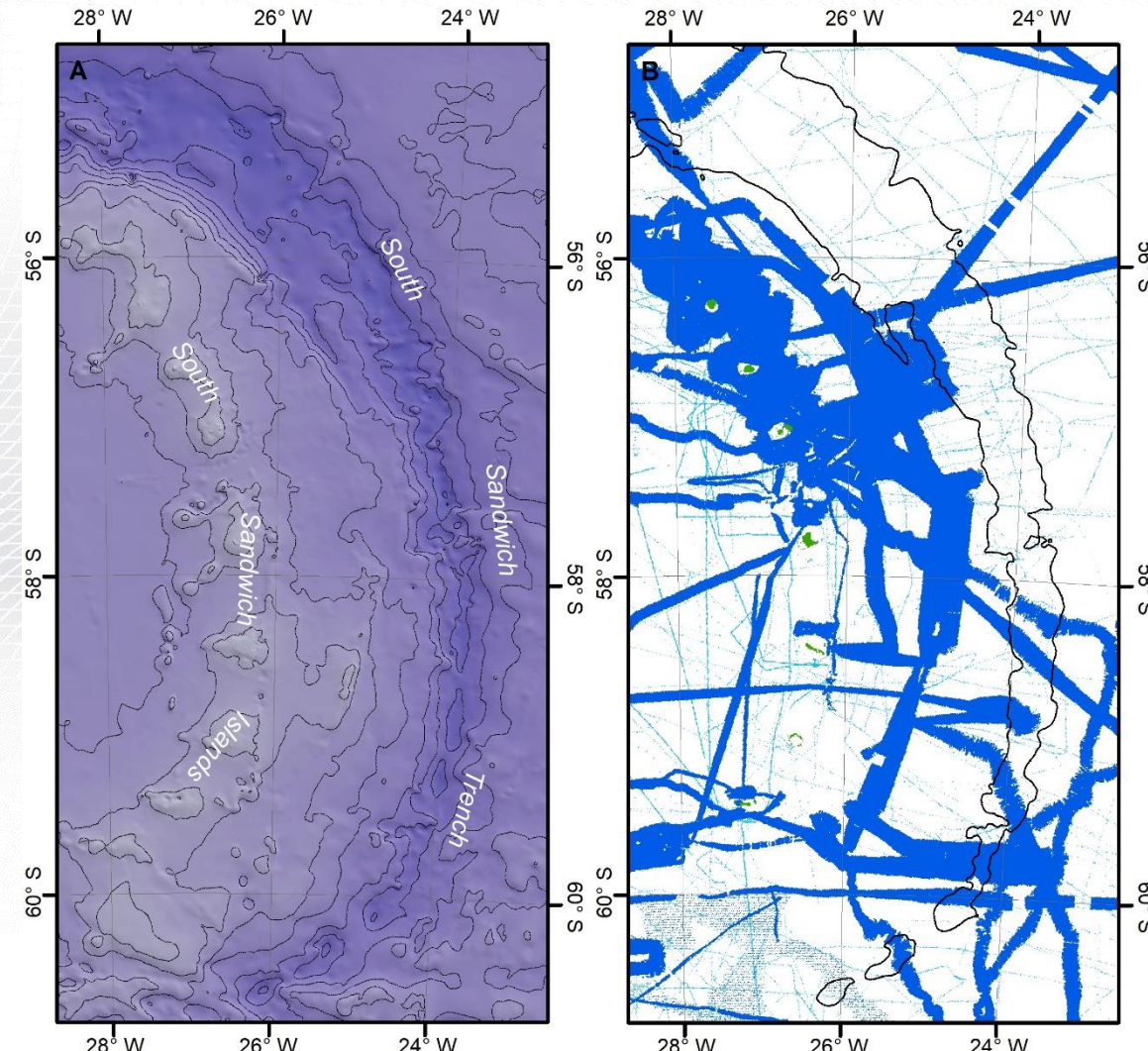


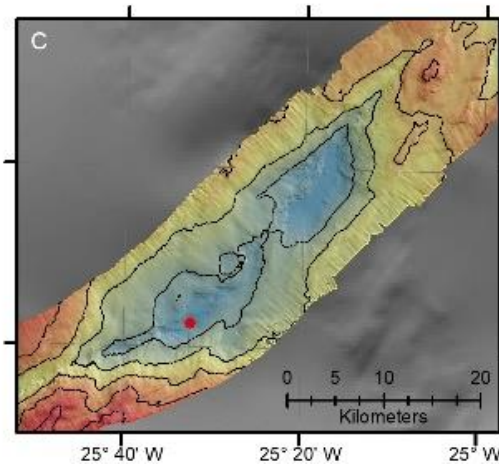
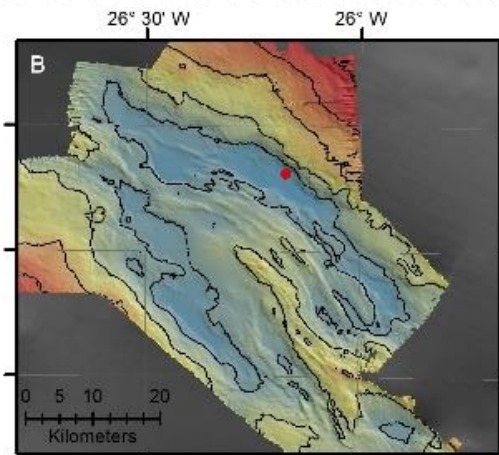
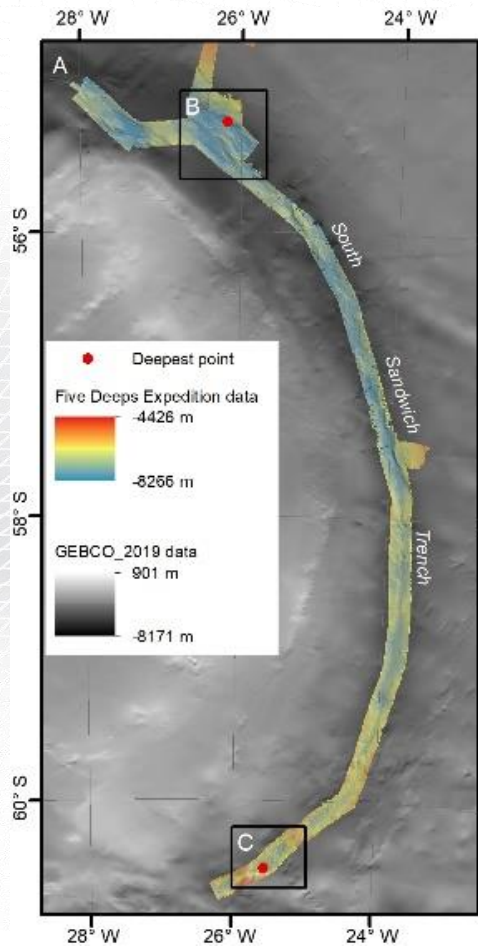
Gebco_2020 Compilation

Source layer shows multibeam bathymetry coverage (dark blue), single-beam coverage (light blue).

Large parts of the trench had no valid data point at all, it was almost exclusively interpolated from satellite altimetry data.

(A) Shaded relief GEBCO 2020 bathymetric grid, black bathymetric contours are at 1000 m intervals from 1000 m to 8000 m water depth. (B) Types of source data comprising direct measurements (no interpolated data sources included), illustrating the lack of detailed information on the bathymetry of the South Sandwich Trench, particularly depths >6000 m and the surrounding waters bathyal-abyssal areas. GEBCO Compilation Group (2020) GEBCO 2020 Grid (doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)





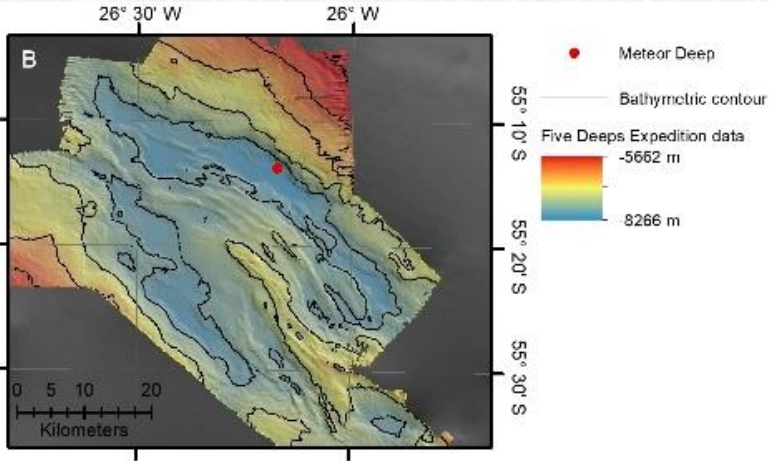
Five Deeps Expedition

- 2-9 Feb. 2019.
- 15,052 km² of multibeam data were acquired (15,045 km² was new coverage).

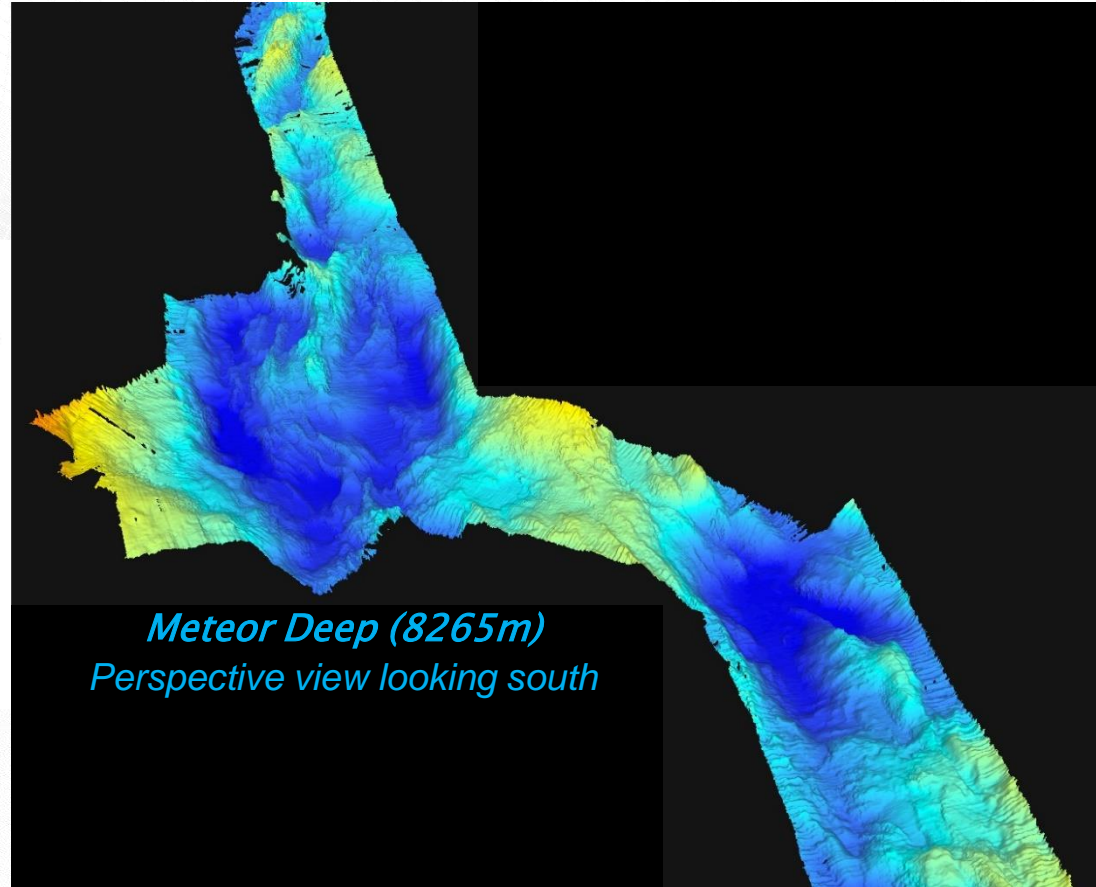
(an area ~3/4 size Wales)



Deepest point

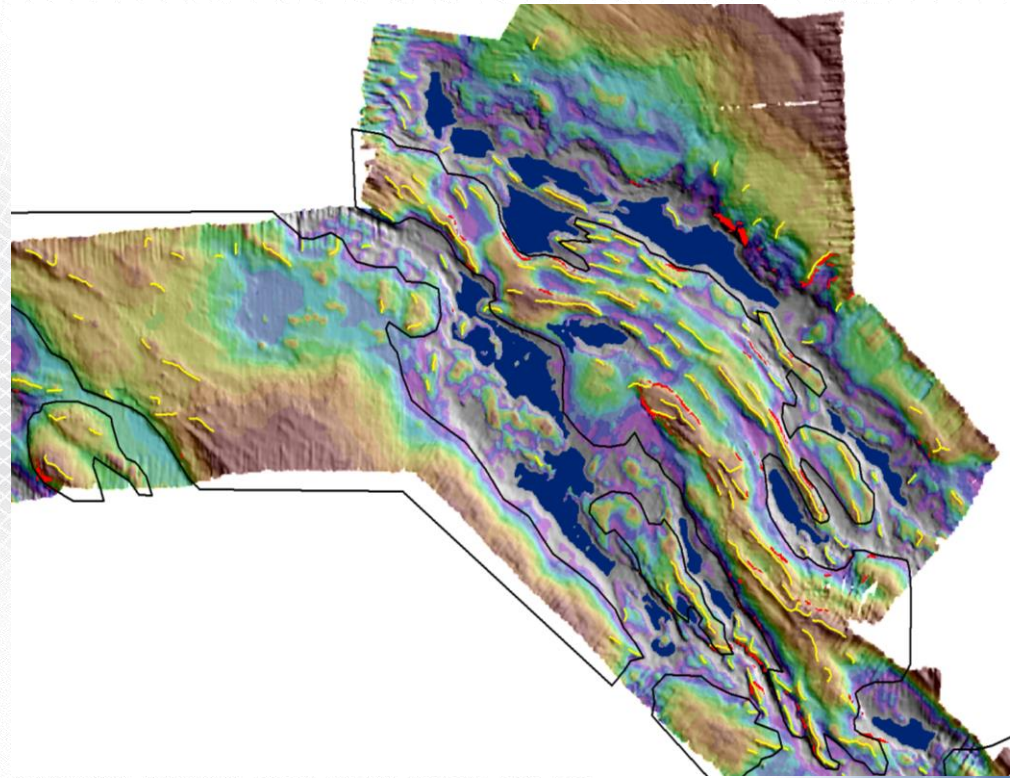


Maximum water depth of 8265 ± 13 m
($55^\circ 13.8' S / 26^\circ 10.38' W$)
(Bongiovanni et al. Submitted to *Geoscience Data Journal*)

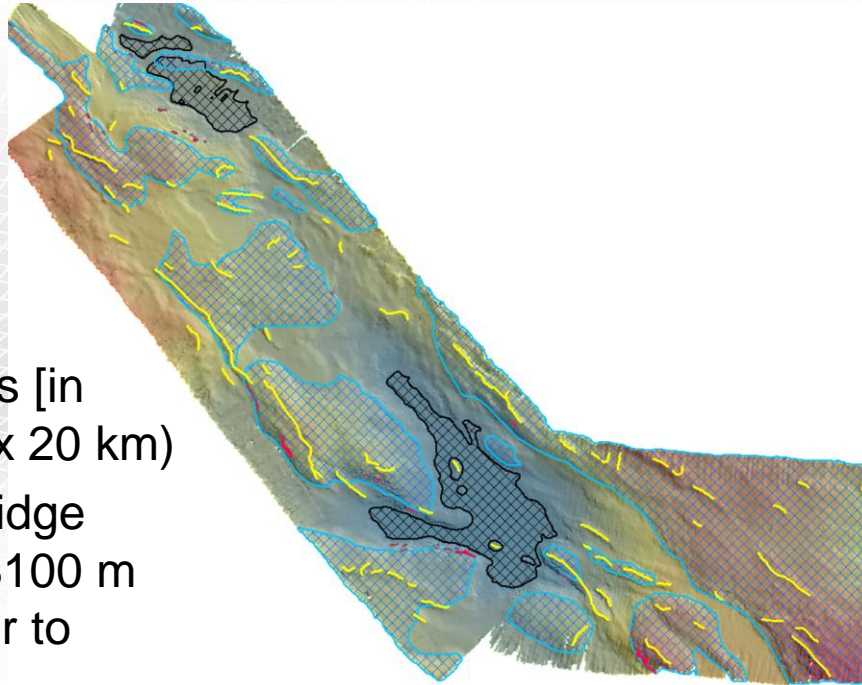


Methodology

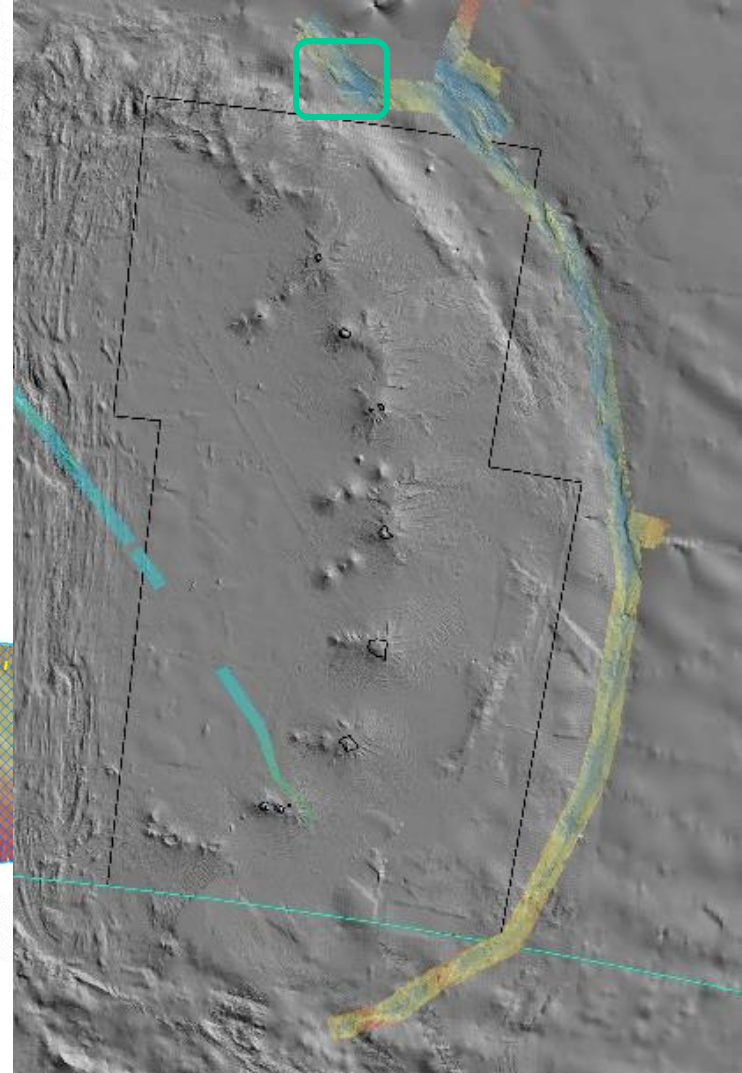
- Geomorphological interpretation in ArcGIS.
- Combination of automated methods run on the bathymetric grid (e.g. TASSE (Lecours, 2015) and BRESS) and expert interpretation.
- Features to map:
 - Trench floor, ridges, escarpments, slopes, seamounts, terraces, submarine landslides (headwalls).



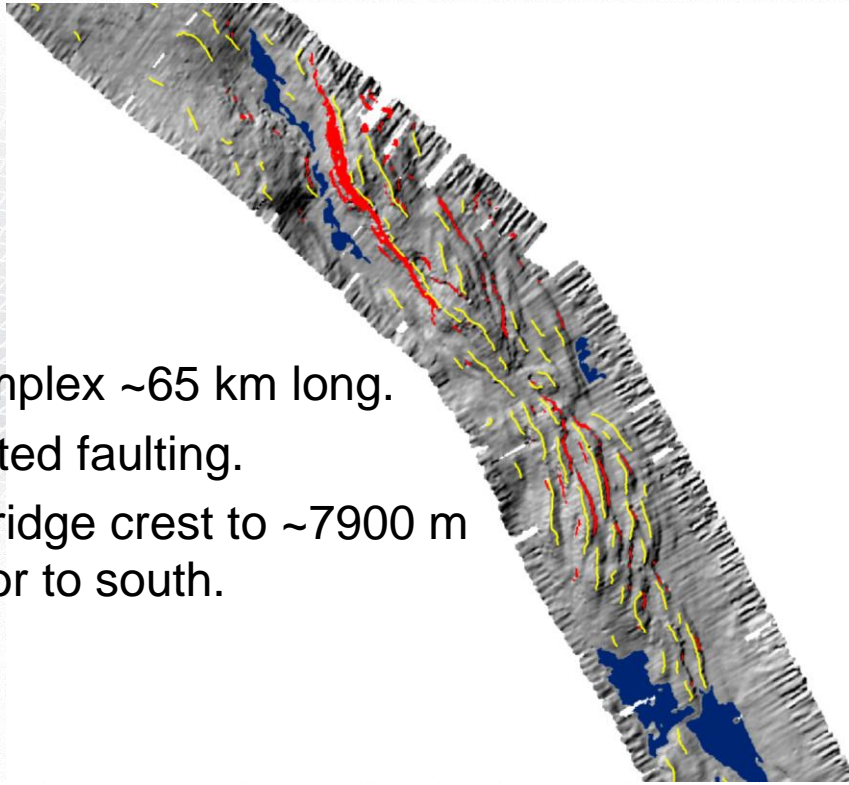
Example #1



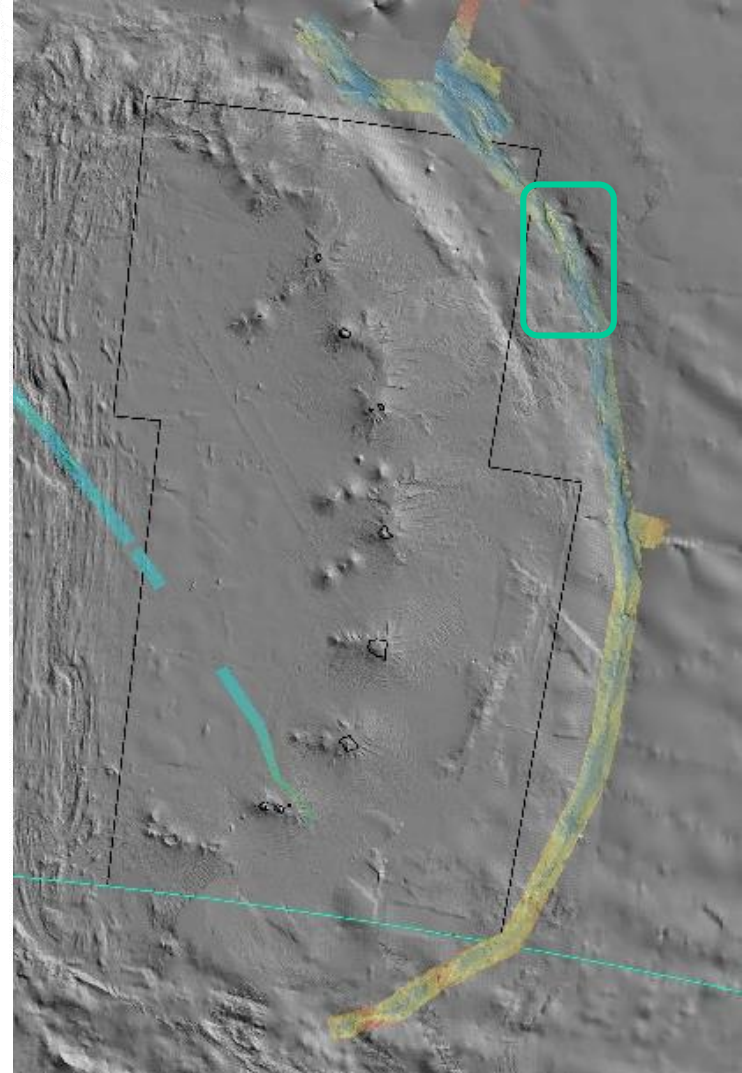
- Seamounts [in blue]. (10 x 20 km)
- ~7100 m ridge crest to ~8100 m trench floor to south.



Example #2

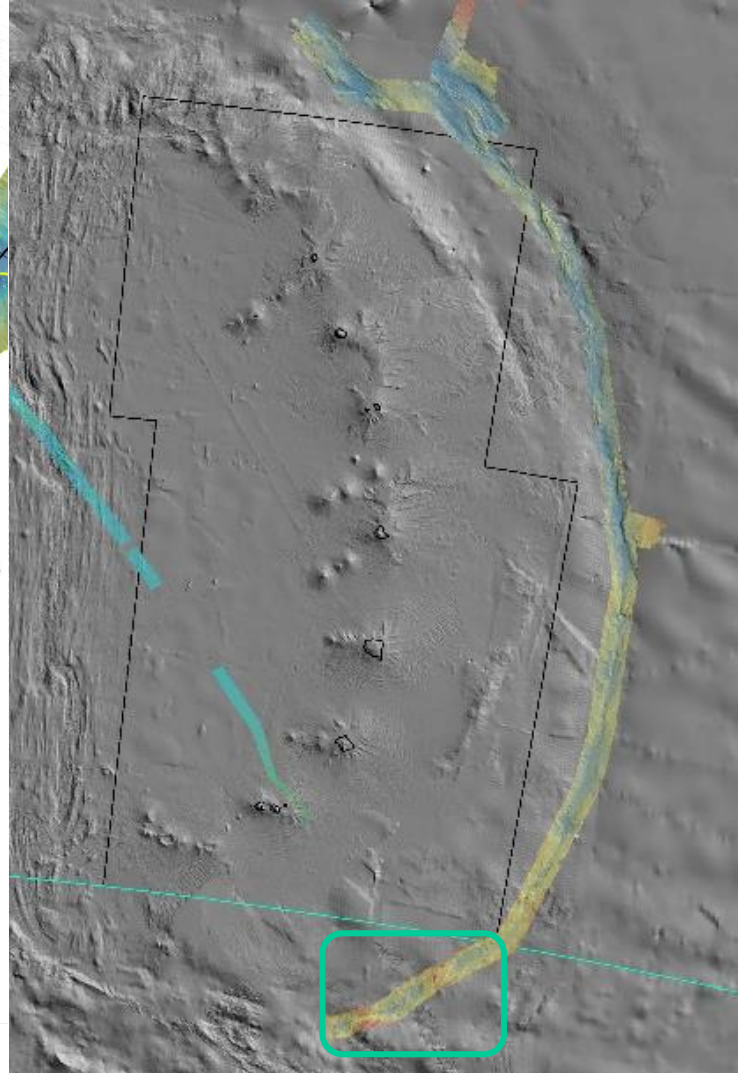
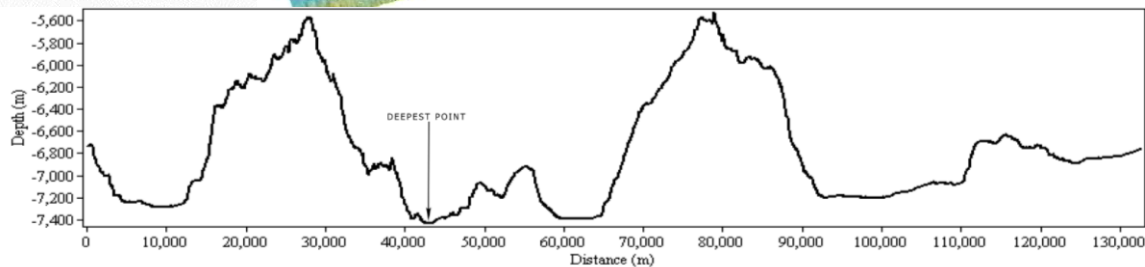
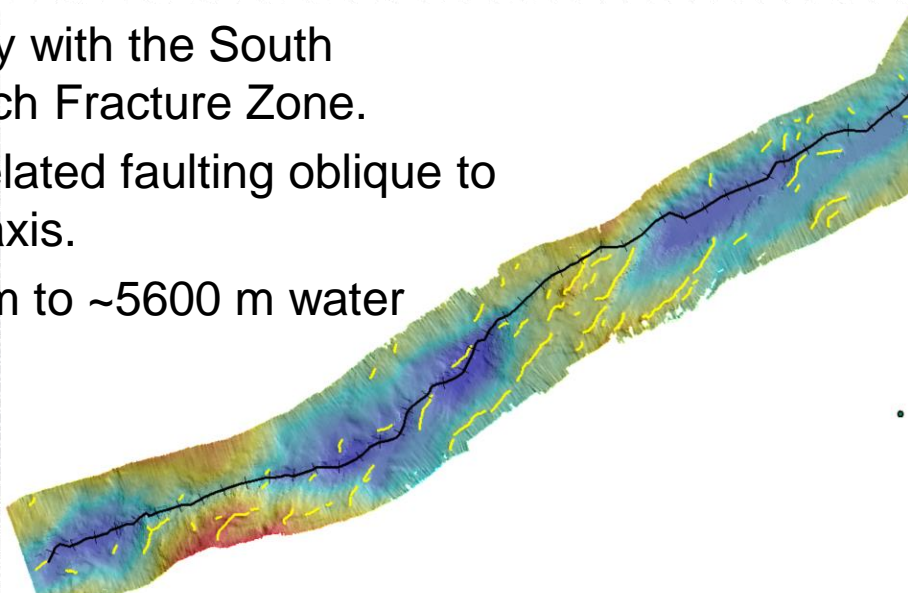


- Ridge complex ~65 km long.
- Bend-related faulting.
- ~6600 m ridge crest to ~7900 m trench floor to south.



Example #3

- Interplay with the South Sandwich Fracture Zone.
- Bend-related faulting oblique to trench axis.
- ~7400 m to ~5600 m water depth



Next Steps

- Publish the geomorphological mapping.
- Look to build on the Landscape Mapping approach published by Hogg *et al.* (2016; 2018).
- Biological study (see Alan Jamieson this session).
- DPLUS Grant running for another ~1 year. Primary focus is to feed the results of this work into the MPA process.
- Delivery through bespoke web-GIS *DPLUS069 PI S. Grant (BAS)*.

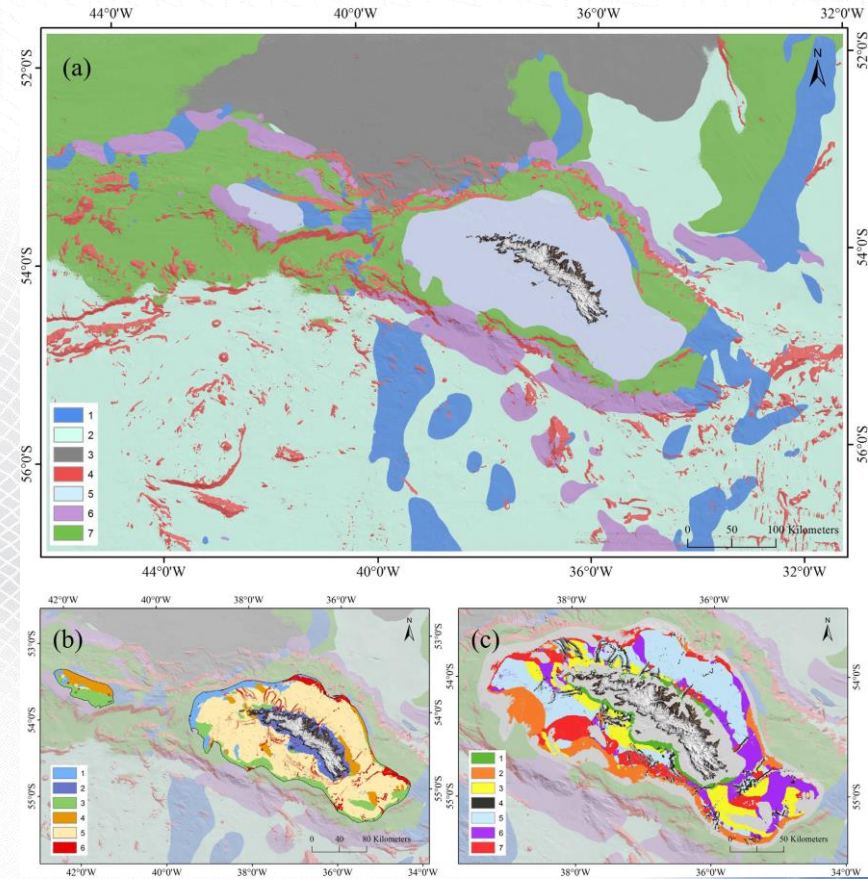


Fig. 5 in Hogg *et al.* 2016 (*Nat. Sci. Rep.* 10.1038/srep33163)

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Officers and crew of DSSV Pressure Drop

In no particular order:

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Questions?

Thanks for listening

