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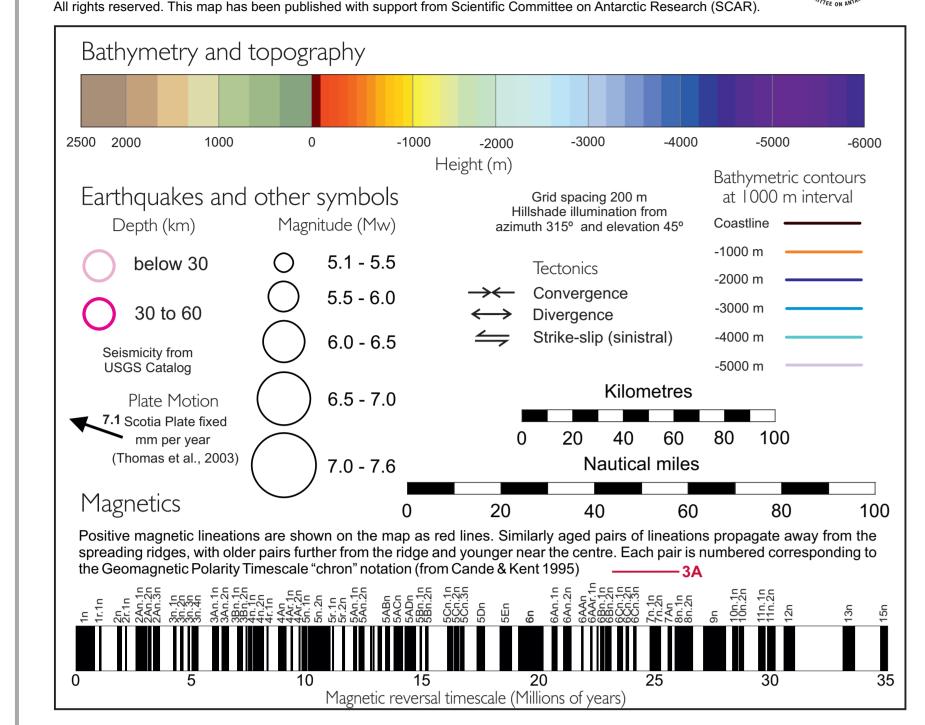
Bathymetry and Geological Setting of the Drake Passage BAS GEOMAP 2 Series, Sheet 7, Edition 1

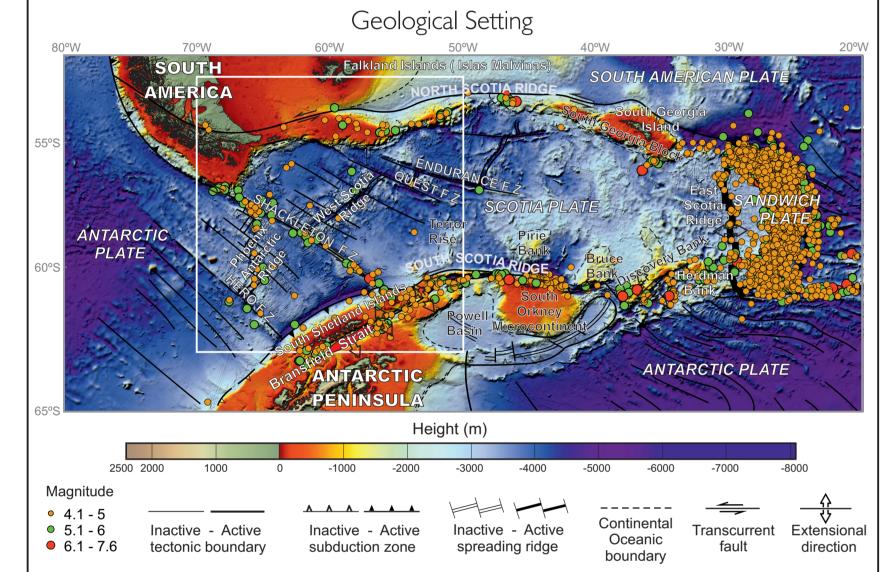
Preferred reference for this map: Bohoyo, F., Larter, R.D., Galindo-Zaldívar, J., Leat, P.T., Maldonado, A., Tate, A.J., Gowland, E.J.M., Arndt, J.E., Dorschel, B., Kim, Y.D., Hong J.K., Flexas M.M., López-Martínez, J., Maestro, A., Bermudez, O., Nitsche, F.O., Livermore, R. A., Riley, T.R. (2016). *Bathymetry and Geological Setting of the Drake Passage (1:1 500 000)*. BAS GEOMAP 2 series, Sheet 7, British Antarctic Survey, Cambridge, UK.

Bathymetric and geophysical interpretation: Bohoyo, F., Larter, R.D., Galindo-Zaldívar, J., Leat, P.T., Maldonado, A., Tate, A.J., Gowland, E.J.M., Arndt, J.E., Dorschel, B., Kim, Y.D., Hong J.K., Flexas M.M., López-Martínez, J., Maestro, A., Bermudez, O., Nitsche, F.O., Livermore, R.A. Design and layout: Bohoyo, F., Riley, T.R.

Projection: Mercator; Spheroid: WGS84; Central meridian: 60°W; True scale latitude: 57.5°S. Published by BRITISH ANTARCTIC SURVEY, High Cross, Madingley Road, Cambridge, CB3 0ET, United Kingdom and INSTITUTO GEOLÓGICO Y MINERO DE ESPAÑA, Ríos Rosas, 23, Madrid 28003, Spain. This map is copyright © British Antarctic Survey (Natural Environment Research Council) and © Instituto Geológico y Minero de España, 2016. All rights reserved. This map has been published with support from Scientific Committee on Antarctic Research (SCAR).







The **Drake Passage** is an oceanic gateway of about 850 km width located between South America and the Antarctic Peninsula that connects the southeastern Pacific and the southwestern Atlantic oceans and influences deep mantle flow, oceanographic water mass exchanges, and migrations of biota. This gateway developed within the framework of geological evolution of the Scotia Arc. The Scotia Arc includes the Scotia and Sandwich plates, which are bounded to the north by the North Scotia Ridge, to the south by the South Scotia Ridge, to the west by the Shackleton Fracture Zone, and to the east by the South Sandwich Trench. The Scotia Sea contains several active and extinct spreading ridges that led to the opening of the Drake Passage. Several

continental banks and oceanic basins are located in Scotia Sea, notably its southern part. The Shackleton Fracture Zone (SFZ) occupies a central position in the Drake Passage and is an intra-oceanic ridge which rises several hundreds to thousands of metres above the surrounding seafloor. The SFZ separates the Scotia Plate of the Scotia Sea to the east and the former Phoenix Plate and the Antarctic Plate to the west, part of the Pacific Ocean. The SFZ is an active transpressional and left-lateral transcurrent fault that accommodates, in conjunction with the North Scotia Ridge and South Scotia Ridge, the relative motion between the Scotia Plate and the South-American and Antarctic plates and connects the Chile Trench with the South Shetland Trench. The SFZ is underthrusted below Elephant Island. The SFZ intersects two extinct spreading centers – the West Scotia Ridge and the Phoenix–Antarctic Ridge – between which the SFZ acted as an oceanic ridge-to-ridge transform fault when both spreading centres were active. The geodynamic evolution of the region, seismic activity and tectonic data suggest a complex evolution of the Drake Passage such that the SFZ began as an oceanic transform fault with strike-slip motion along most of its length and then formed a transpressive transcurrent fault zone as at present day. Uplift of the SFZ in the last 8 Myr has formed a barrier for oceanic bottom currents.

The Phoenix-Antarctic spreading axis was extinct by chron C2A (2.6-3.6 Ma), when the Phoenix Plate became part of the Antarctic Plate, and following a long period of late Mesozoic and Cenozoic subduction of the Phoenix Plate below the Pacific Margin of the Antarctic Peninsula. Subduction continued at the **South Shetland Trench** due to rollback of the hinge of subduction and active spreading in the Bransfield Strait.

The West Scotia Ridge formed most of the oceanic crust of the Scotia Sea from early Oligocene to its extinction after chron C3A (6.4 Ma) during a period of regional Scotia Sea compression after 17 Ma due to the migration of the pole of rotation. The West Scotia Ridge spreading segments are separated by former transform faults. On its eastern part, the **Endurance** and **Quest** fracture zones are clearly recognisable. Recent studies of the Drake Passage geodynamics suggest opening of oceanic basins that developed in the southwestern Scotia Arc during Eocene time.

The opening of the main southern oceanic gateways, Drake Passage and the Tasmanian gateway separating South America and Australia from Antarctica respectively, permitted the modern pattern of global ocean circulation to be established. This allowed extensive exchange of water between the main ocean basins and led to the development of the Antarctic Circumpolar Current, which contributed to the thermal isolation of Antarctica, was partially responsible for global cooling at the Eocene-Oligocene boundary and played an important role in middle Miocene cooling.

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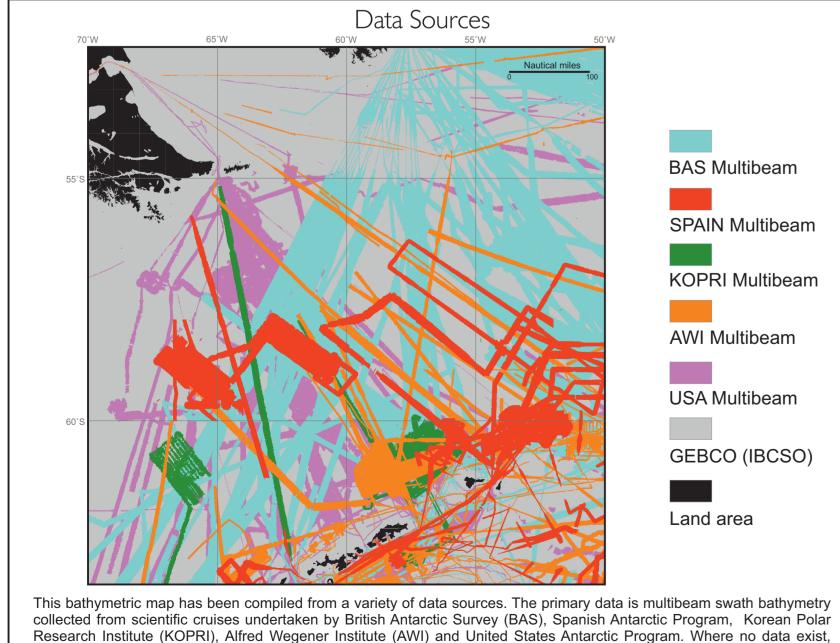
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Research Institute (KOPRI), Alfred Wegener Institute (AWI) and United States Antarctic Program. Where no data exist, global compilations from the General Bathymetric Chart of the Oceans (GEBCO) including the International Bathymetric Chart of the Southern Ocean (IBCSO) have been used; this data set uses satellite altimetry in areas where data are sparse. Merging and gridding the dataset has been conducted using GMT, Fledermaus, ArcGIS and Global Mapper. Arndt, J.E., Schenke, H.W., Jakobsson, M., Nitsche, F., Buys, G., Goleby, B., Rebesco, M., Bohoyo, F., Hong, J.K., Black, J., Greku, R., Udintsev, G., Barrios, F. Weatherall, P., Marks, K.M., Jakobsson, M., Schmitt, T., Tani, S., Arndt, J.E. Reynoso-Peralta, W., Morishita, T., Wigley, R., 2013. The International Bathymetric Rovere, M., Chayes, D., Ferrini, V., Wigley R., 2015. A new digital bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0 – A new bathymetric compilation model of the world's oceans. Earth and Space Science, 2, 331–345.

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