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Assessing benthic habitats: the influence of scale

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Assessing the distribution, diversity and characteristics of benthic habitats relies largely on the collection and analysis of physical datasets. One of the primary physical datasets used is bathymetry data. Bathymetric information can be used to map key potential habitat features such as seamounts, hydrothermal vents and submarine canyons, and provides an understanding of seafloor processes, including bottom currents, sediment deposition and areas of hard and soft substrates. Our knowledge of seafloor bathymetry for the Southern Ocean varies considerably, depending on mapping effort. Broad-scale compilations of satellite and ship data around the Antarctic margin (e.g. IBCSO, 2015) allow mapping of habitat features at 500 m resolution, while for much of the Sub-Antarctic, data are only available at 1-minute resolution (~1.85 km). In contrast, dedicated multibeam surveys produce seafloor bathymetry at 1 to 200 m resolution, depending on water depth, however, for the Southern Ocean these studies are restricted to relatively small areas.

So how does the scale of observational data affect our assessment of benthic habitats? The aim of our research is to determine the data resolution required to adequately map potential benthic habitats. We assess the detection of seamounts from the Heard and McDonald Islands region from bathymetry datasets ranging from 10 m to 1.85 km resolution. We use steep seabed slopes to infer hard substrates from nearshore and continental slope datasets, and test the effect of data resolution on our assessment of these habitats. We analyse heavily iceberg scoured regions from the outer shelf at various data resolutions, and finally use terrain analysis tools to assess mapping of key habitat features at a range of scales. These analyses show that there is an optimal ratio between the scale of analysis and data resolution where benthic habitats can be adequately and confidently mapped.