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A new method for characterising the Antarctic Circumpolar Currents using Argo float temperature and salinity profiles

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Argo is an array of automated profiling floats, which have allowed the rapid development of high-resolution and high-quality oceanographic data acquisition. The international program has been in operation since the 1990s providing continuous hydrographic data globally. There are now over a million individual float profiles, contributing to our understanding of global ocean physical properties, such as circulation processes at both a local and regional scale. With these innovations come the challenges of data processing, and compilation of user-friendly data products. For example, the Southern Ocean is a critical region that modulates our climate, via heat exchange, carbon storage, biogeochemistry, and primary productivity. An improved quantified understanding of Southern Ocean currents, informed by Argo, must be implemented in policy-relevant high-resolution climate models to advance our understanding of future change.

In May 2019, a new collaboration was formed between the Southern Ocean Argo Resource Centre (British Oceanographic Data Centre) and the University of Bristol. The aims were two-fold: to produce a method for characterising Southern Ocean frontal zones using Argo floats, and to train early career researchers in the University sector in data processing and management. We have created a publicly available code that characterises physical features of the Antarctic Circumpolar Current using Argo float profiles, using minimal software, and without the need to access high-performance computers. The code categorises each profile based on the temperature and salinity ‘fingerprints’ of zones between each Southern Ocean front. This allows the user to produce output surface plots from user-specified time-slices and geographic areas, and so compare frontal movement in time and space.

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