Profiling float observations of enhanced carbon uptake in the Zapiola Anticyclone

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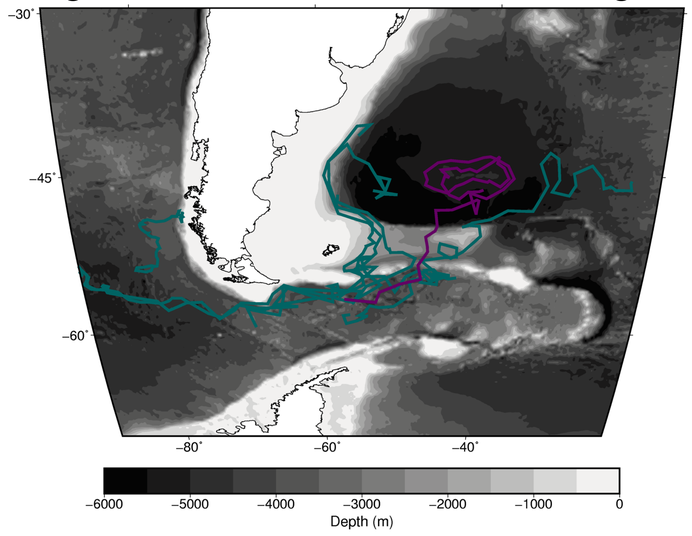
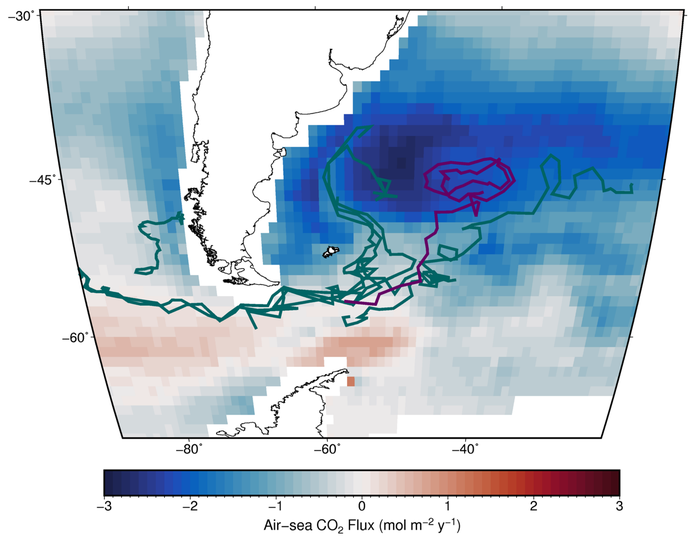
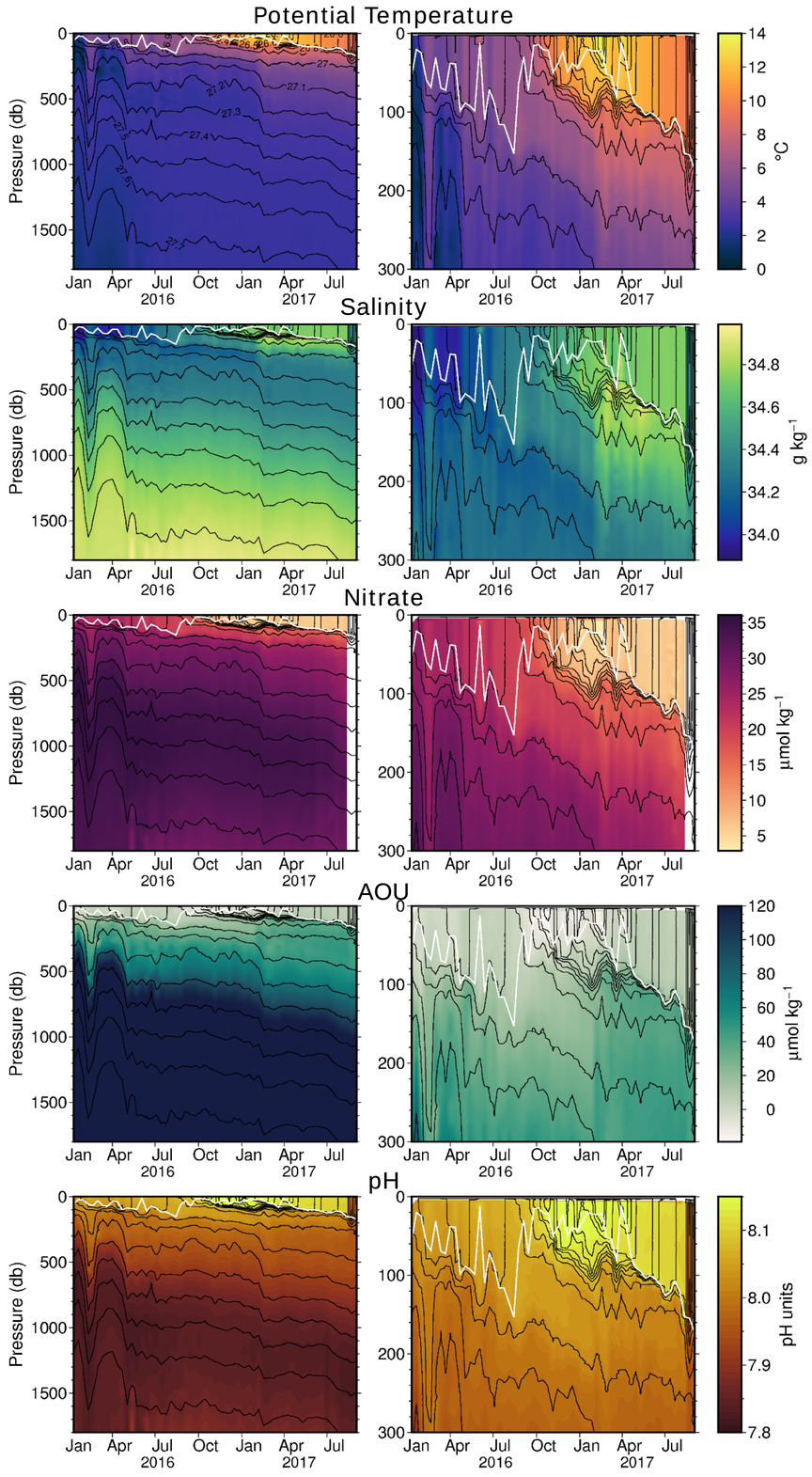
The Zapiola Anticyclone is a counterclockwise circulation feature associated with the Zapiola Rise, a sedimentary deposit located near the Brazil-Malvinas Confluence region (de Miranda et al. 1999). This strongly barotropic flow has been estimated to be 100 Sv (Saunders and King 1995). Despite being located in a region with significant carbon uptake, the impact of this feature on air-sea CO_2 fluxes and biogeochemical cycles is largely unknown.

Bottom depth and trajectories of biogeochemical floats in the region



Annual mean air-sea CO_2 flux from Landschützer et al. 2015

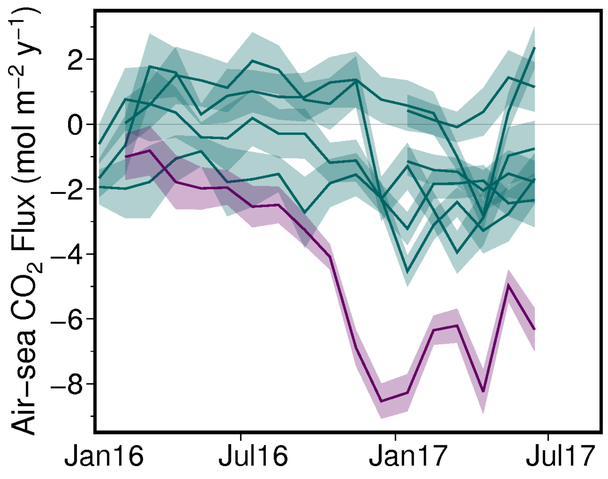




Several biogeochemical profiling floats have been deployed in this region by the Southern Ocean Carbon and Climate Observations and Modeling (SOCCOM) project, measuring temperature, salinity, oxygen, nitrate, and pH in the upper 1800 m. One of these floats (WMO ID 5904657) was trapped in the Zapiola Anticyclone from August 2016 to September 2017.

The pH data were combined with an empirical estimate of total alkalinity (Carter et al. 2016) to estimate seawater pCO_2. These estimates were then used together with atmospheric CO_2 observations and atmospheric reanalysis data to estimate air-sea fluxes (Gray et al. submitted).

The float trapped in the Zapiola Anticyclone showed significantly stronger fluxes into the ocean than all of the nearby floats. This result is being investigated further to understand the causes of this anomaly.



References

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