

Carbon cycling during the spring bloom in the Southern Ocean observed by the SOCCOM profiling float array

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OceanObs'09

*Ocean information for society:
sustaining the benefits,
realizing the potential*

21-25 September 2009, Venice, Italy

**ADDING OXYGEN TO ARGO: DEVELOPING A GLOBAL IN-SITU OBSERVATORY FOR
OCEAN DEOXYGENATION AND BIOGEOCHEMISTRY**

US Ocean Carbon & Bgc Scoping Workshop

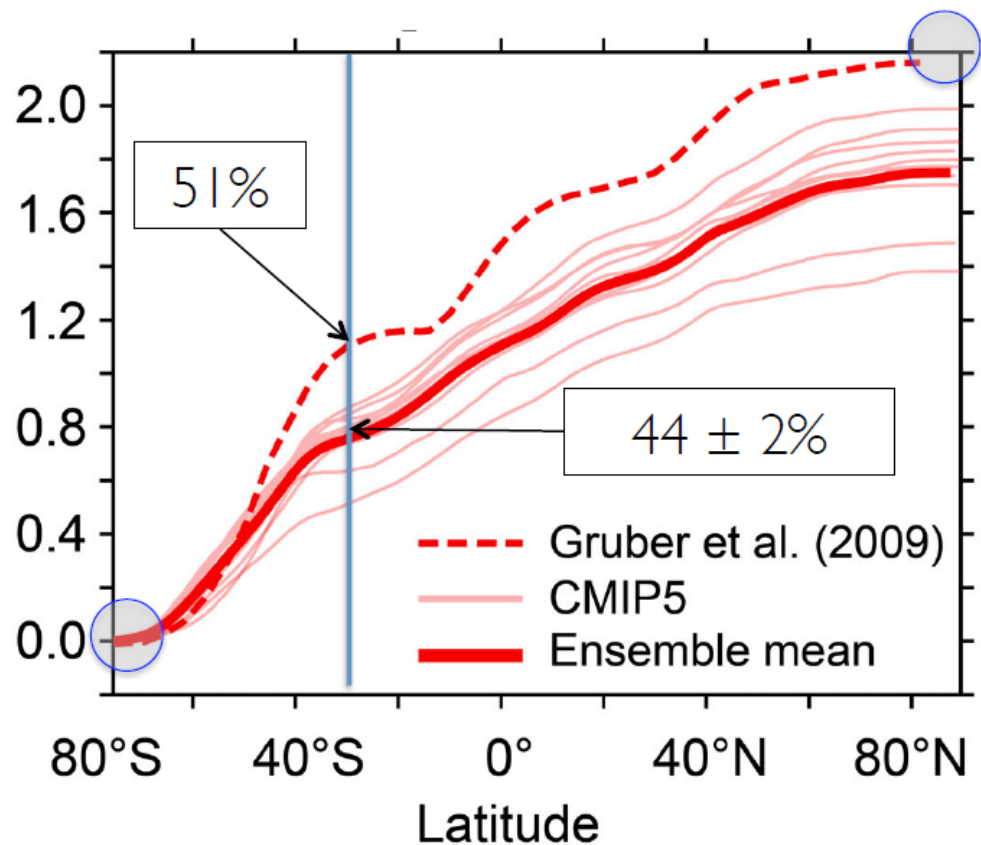
Observing biogeochemical cycles at global scales
with floats and gliders

A U.S. Southern Ocean Carbon, Ecosystems and Biogeochemistry Science Plan

A report of the Southern Ocean Scoping Workshop sponsored
by the Ocean Carbon and Biogeochemistry Program and the
NSF Office of Polar Programs

Why study carbon cycling in the Southern Ocean?

- The Southern Ocean comprises only about 30% of the world's ocean area, it accounts for half the ocean's uptake of anthropogenic carbon from the atmosphere.



Why?

- Vertical exchange in the Southern Ocean supplies nutrients that fertilize up to three-quarters of the biological production in the global ocean north of 30°S

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High-latitude controls of thermocline nutrients and low latitude biological productivity

J. L. Sarmiento¹, N. Gruber², M. A. Brzezinski³ & J. P. Dunne⁴



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Why?

- The Southern Ocean south of $\sim 60^{\circ}\text{S}$ is highly sensitive to acidification due to low carbonate ion concentrations at cold temperatures.

Southern Ocean acidification: A tipping point at 450-ppm atmospheric CO_2

Ben I. McNeil^{a,1} and Richard J. Matear^b

18860–18864 | PNAS | December 2, 2008 | vol. 105 | no. 48

nature
geoscience

LETTERS

PUBLISHED ONLINE: 25 NOVEMBER 2012 | DOI:10.1038/NCEO1635

Extensive dissolution of live pteropods in the Southern Ocean

N. Bednaršek^{1,2,3}, G. A. Tarling^{1*}, D. C. E. Bakker², S. Fielding¹, E. M. Jones⁴, H. J. Venables¹, P. Ward¹, A. Kuzirian⁵, B. Lézé², R. A. Feely⁶ and E. J. Murphy¹




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The screenshot shows a web browser window displaying the SOCCOM website. The browser's address bar shows 'soccom.princeton.edu'. The page features a navigation menu with links for 'ABOUT US', 'RESEARCH', 'BROADER IMPACTS', 'RESOURCES', 'NEWS', 'BLOG', 'CONTACT US', and 'MEMBERS ONLY'. A search bar is located on the left side of the navigation bar. The main content area includes a large banner with the SOCCOM logo and the text 'Unlocking the mysteries of the Southern Ocean'. Below the banner is a photograph of three researchers in yellow and orange gear working on a ship's deck. A blue sidebar on the left contains the text 'SOCCOM is launched!' and 'The SOCCOM project has been awarded funding from the National Science Foundation and was officially launched on September 9, 2014.' Below this is a 'Latest News' section with a thumbnail image of the Golden Gate Bridge and the headline 'Southern Ocean Town Hall at AGU'. The text below the headline reads: 'Join us on Dec. 14th to discuss SOCCOM and other progress'.

SOCCOM | Unlocking the

soccom.princeton.edu

Apps Google FloatVIZ Version 6.0 LOBOVIZ Version 3.0 NDBC - Station 46042 The Canyon Head JUL_DAY Other bookmarks



SOCCOM

Unlocking the mysteries of the Southern Ocean


SOCCOM is launched!

The SOCCOM project has been awarded funding from the National Science Foundation and was officially launched on September 9, 2014.

SEARCH SOCCOM

ABOUT US | RESEARCH | BROADER IMPACTS | RESOURCES | NEWS | BLOG | CONTACT US | MEMBERS ONLY

Latest News



Southern Ocean Town Hall at AGU

Join us on Dec. 14th to discuss SOCCOM and other progress

SOUTHERN OCEAN CARBON AND CLIMATE OBSERVATIONS AND MODELING

The Southern Ocean Carbon and Climate Observations and Modeling project (SOCCOM) is an NSF-sponsored program focused on unlocking the mysteries of the Southern Ocean and determining its influence on climate.

SOC COM funded by NSF for 6 years with additional support from NOAA and NASA

Directorate

Theme I
Observations

Theme II
Modeling

Theme III
Education & Outreach



Jorge Sarmiento,
Princeton



Lynne Talley,
SIO



Joellen Russell,
U. Arizona



Heidi Cullen,
Climate Central



Ken Johnson



Steve Riser, U. W.



Biooptics (Emmanuel Boss,
Maine, Oscar Schofield, Rutgers)



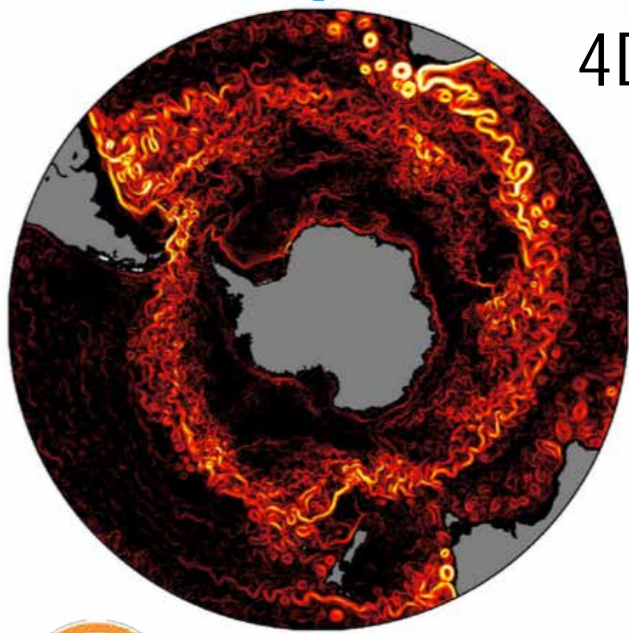
SOC COM

23 senior researchers at 11 institutions

200 profiling floats over 6 years with pH, NO_3^- , O_2 , biooptics with calibration tied to GO-SHIP observations



Southern Ocean State Estimate model to get 4D fluxes



Improved coupled climate model (GFDL) predictions of Southern Ocean role in carbon and climate



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Deep-Sea DuraFET
pH sensor (Ion
Sensitive FET
transistor)

ISUS (or SUNA)
optical nitrate
sensor

Aanderaa or SBE
63 oxygen optode
& WETLabs FLBB
or MCOM

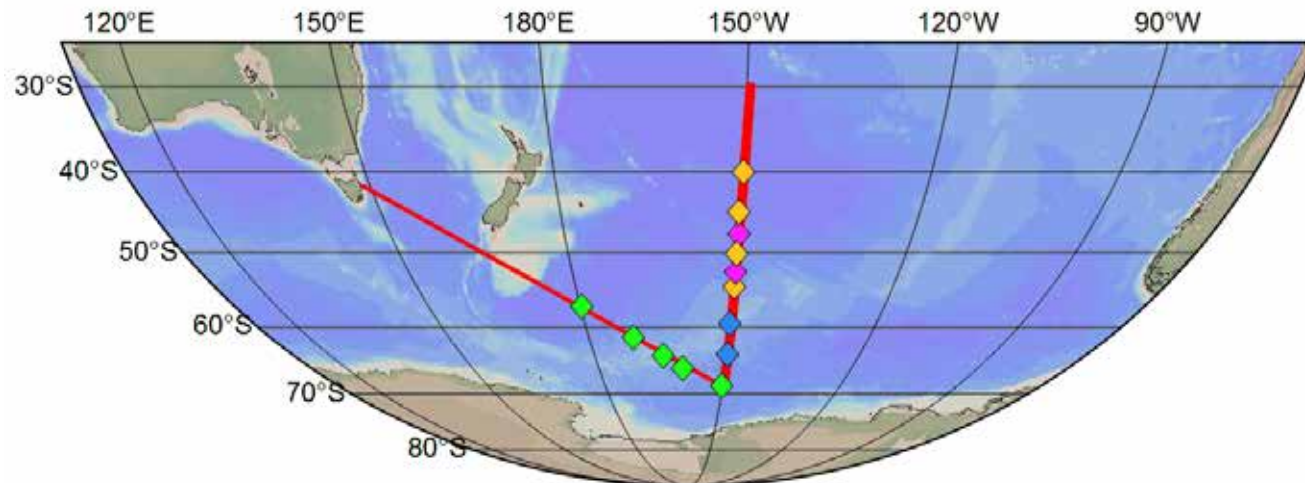


Navis

APEX



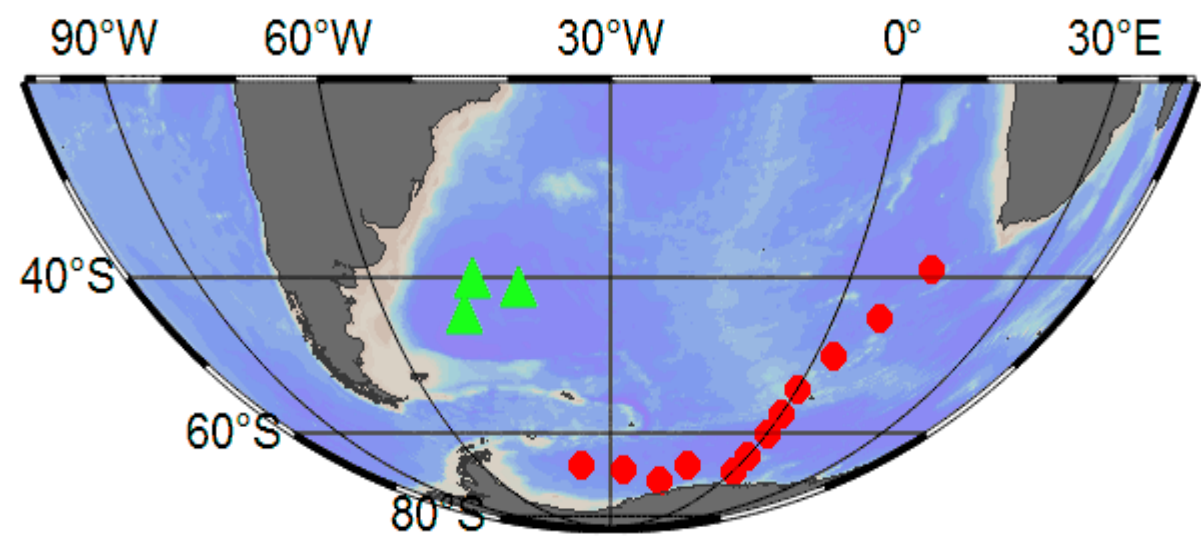
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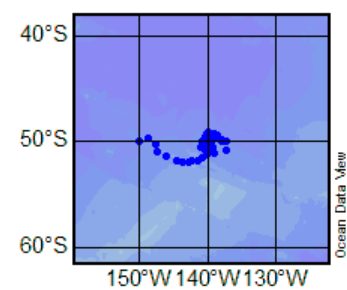
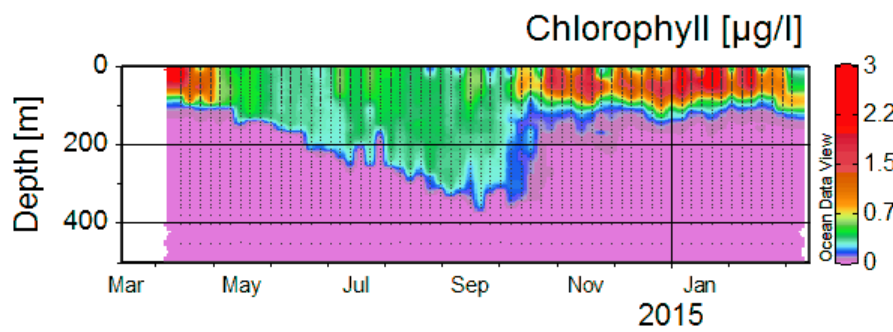
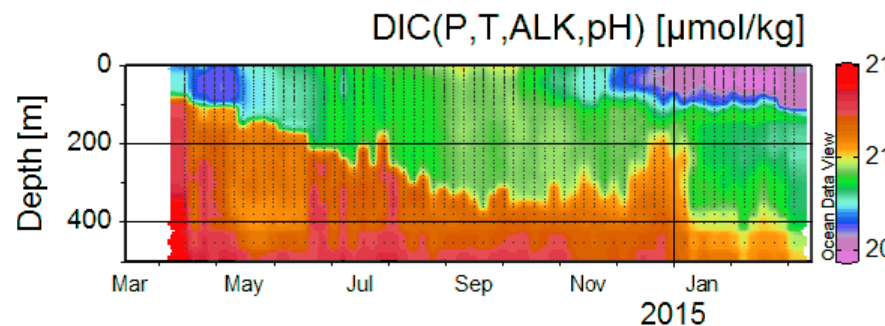
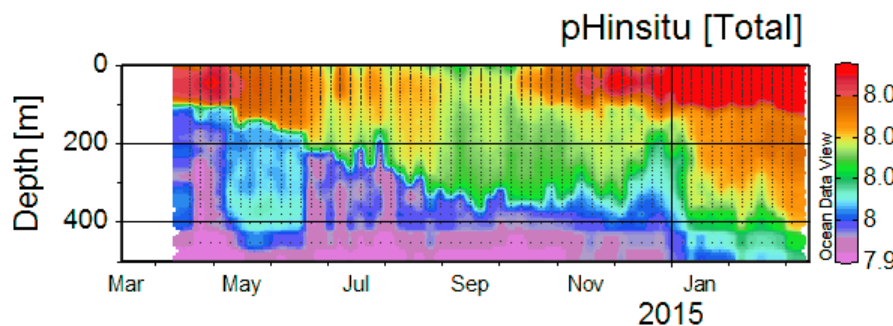
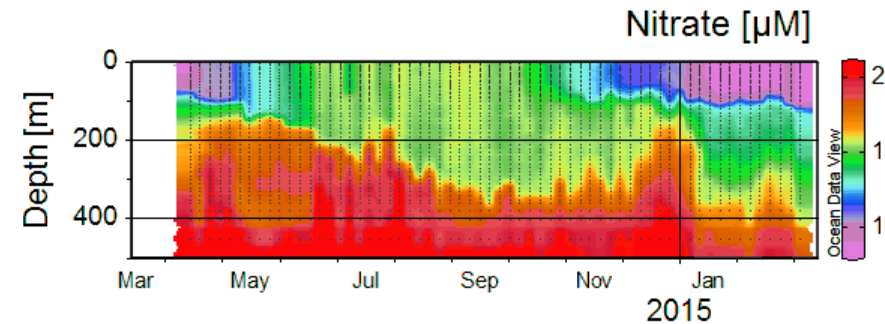
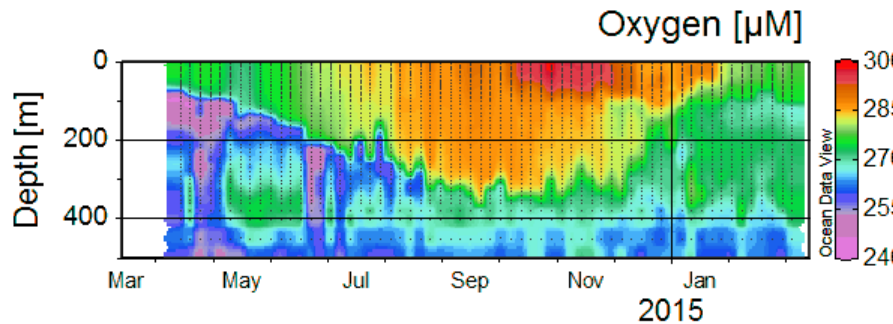
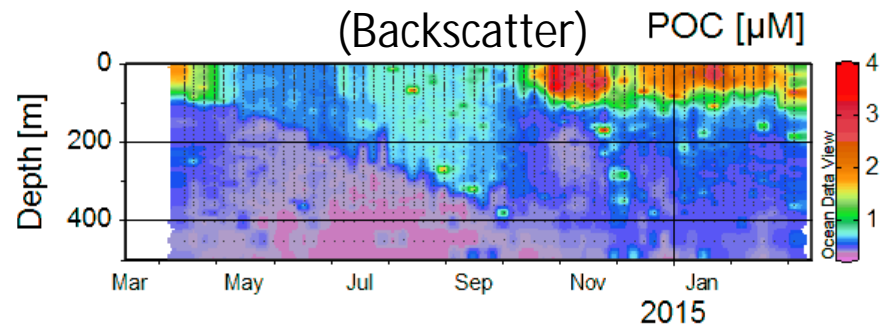
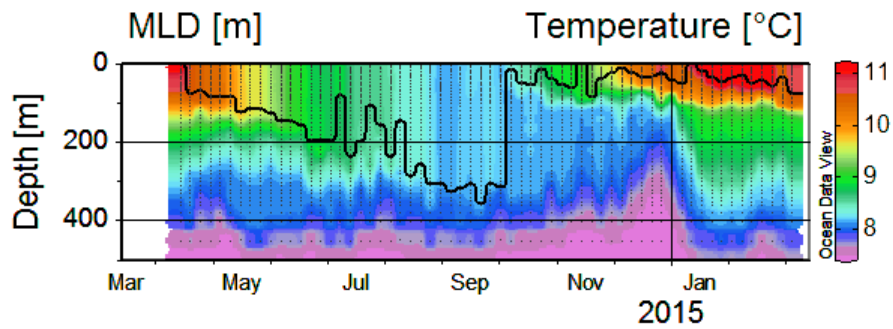
12 Pre-SOCCOM floats, March-May 2014, P16S

Ocean Data View

12 SOCCOM floats, Dec. 2014, Polarstern

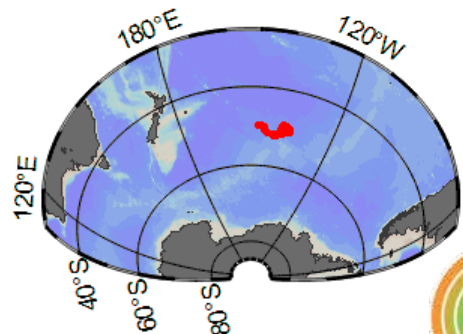
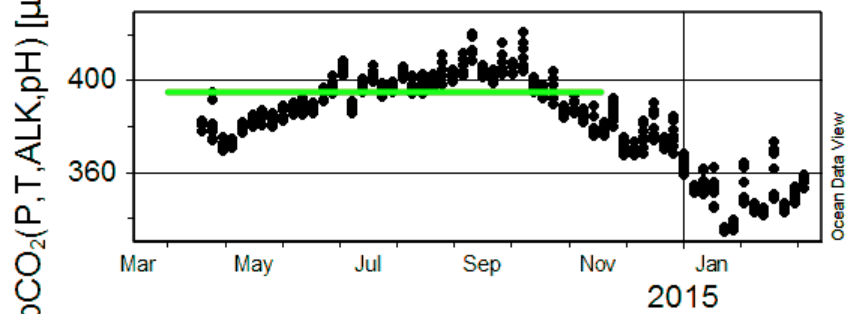
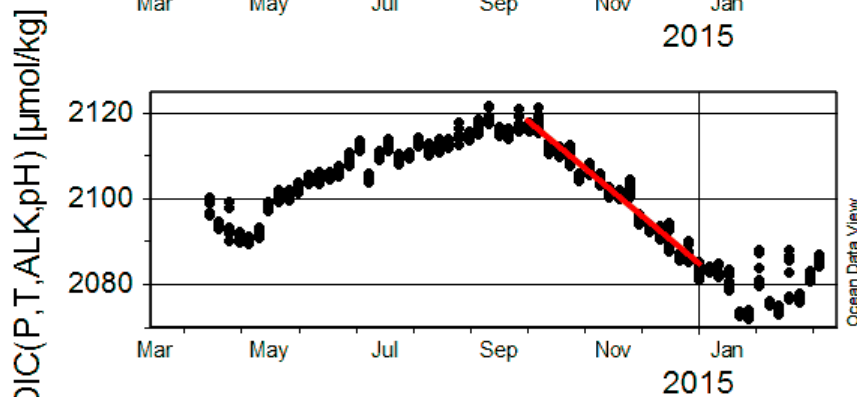
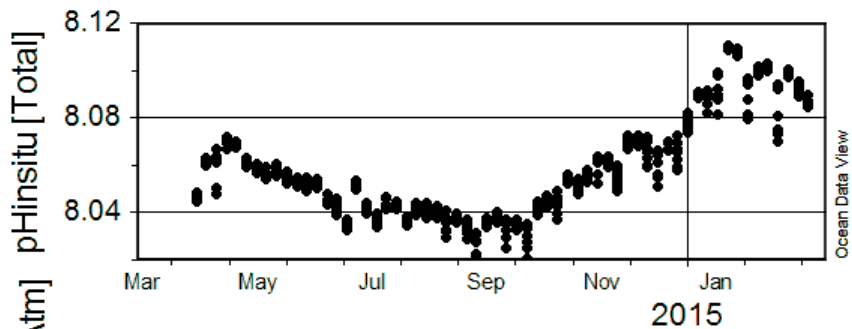
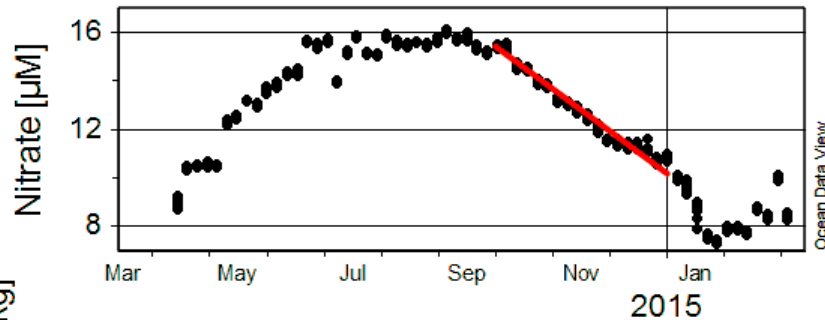
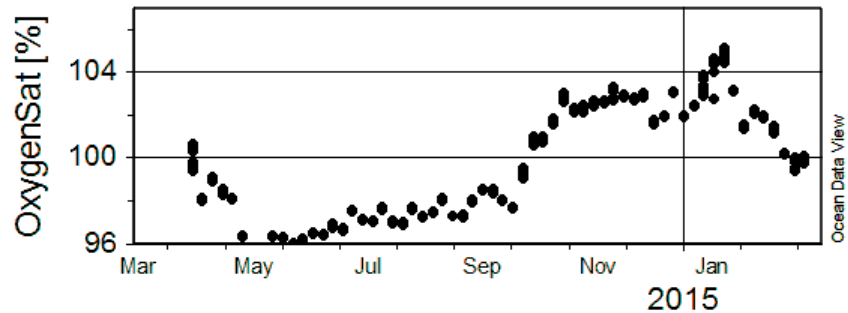
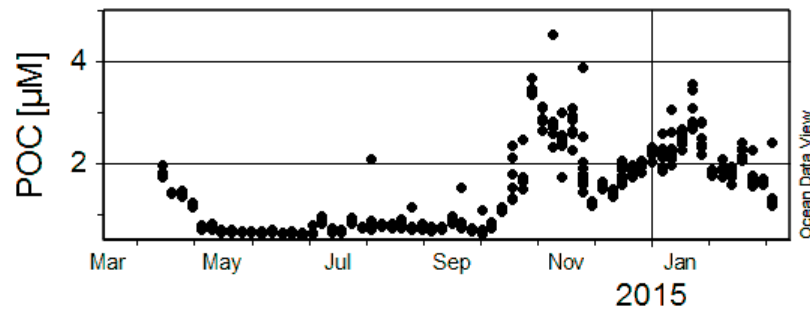
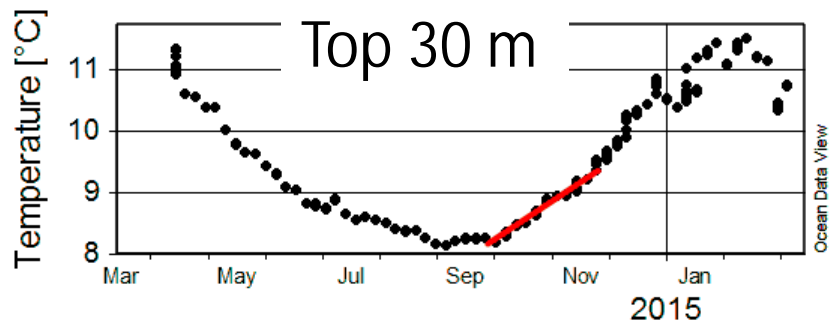


Ocean Data View



Float
9095

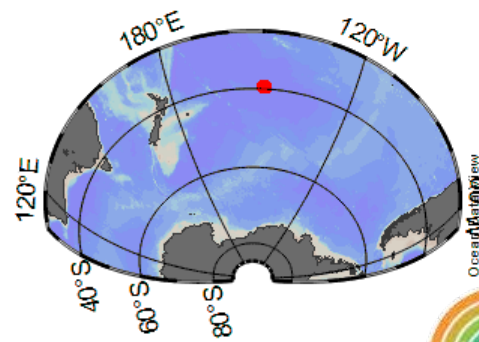
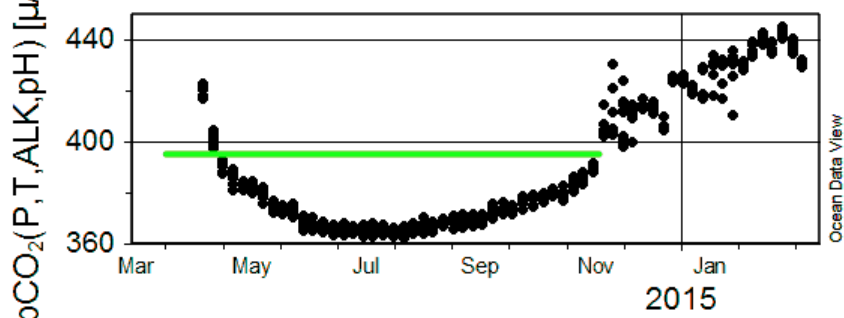
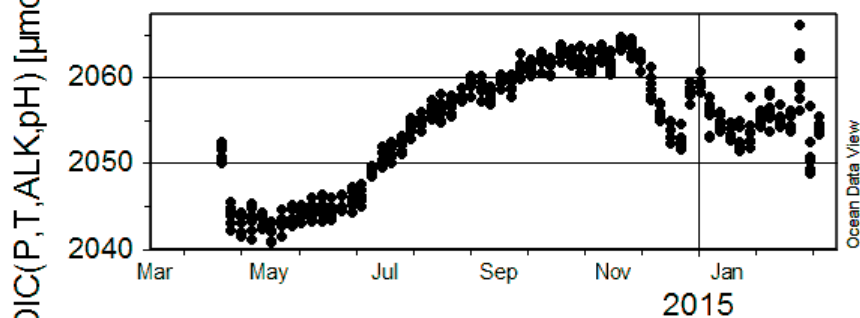
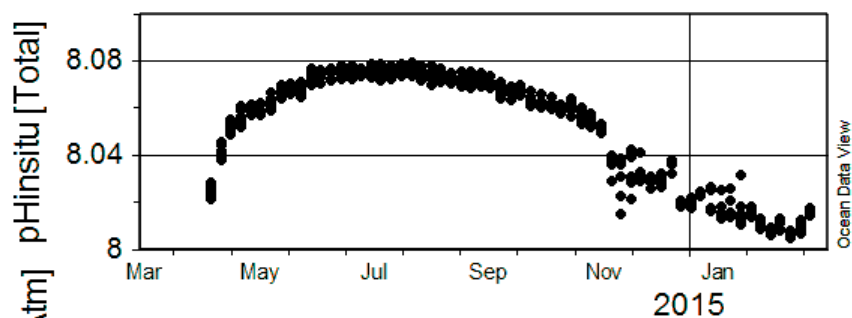
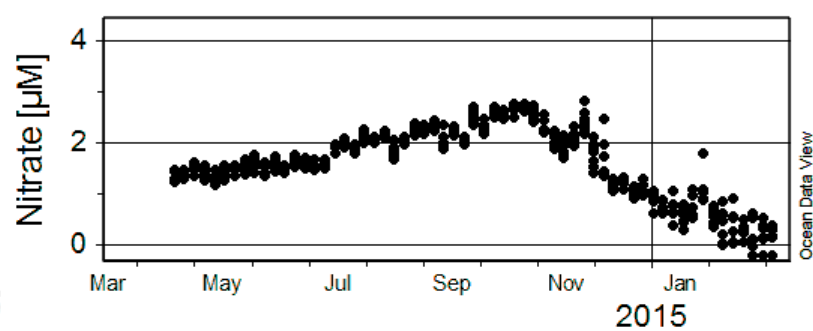
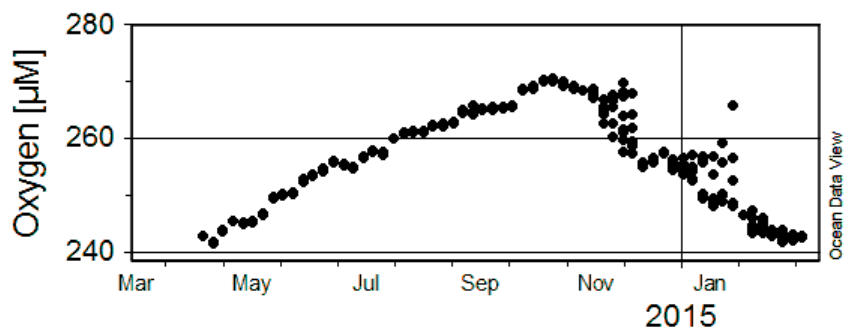
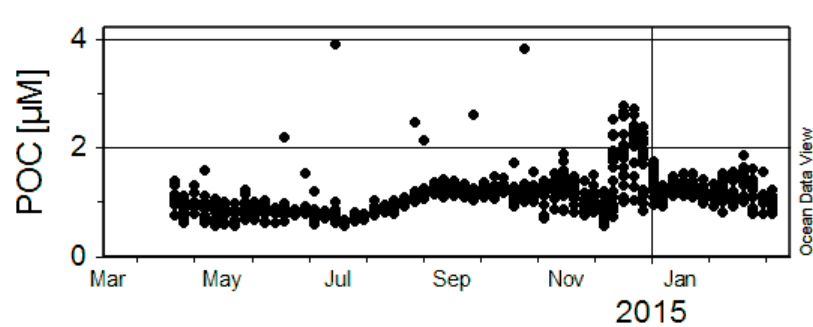
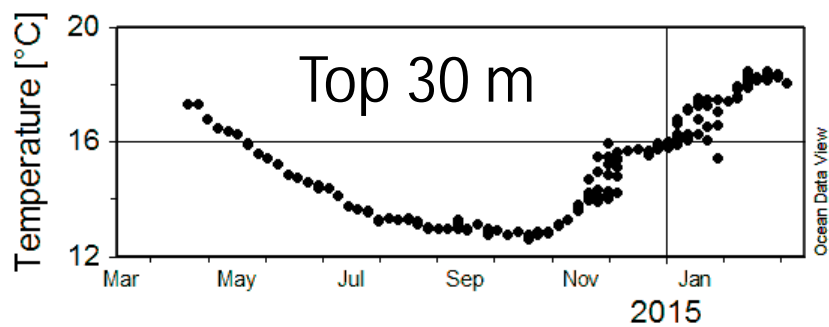




Float
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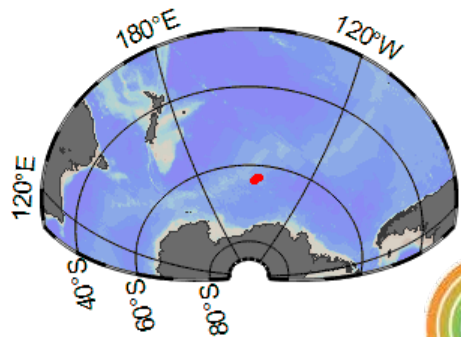
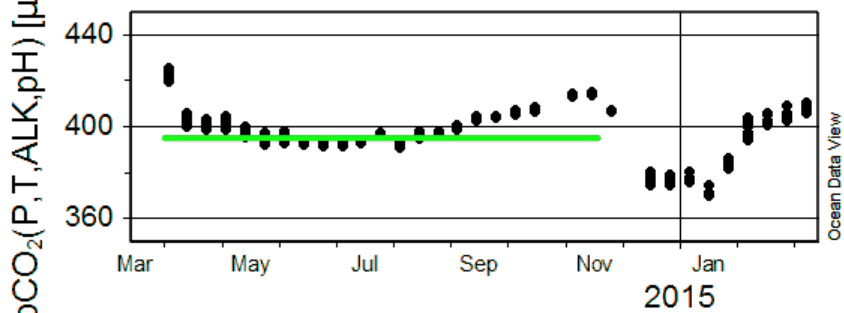
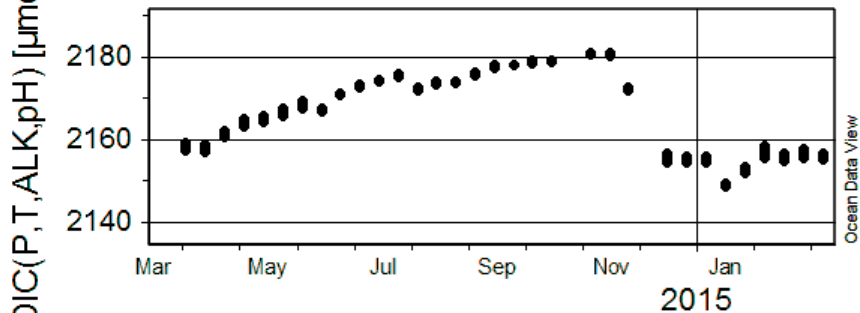
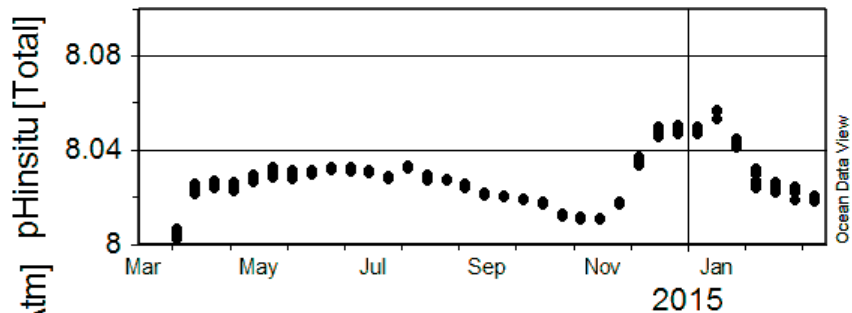
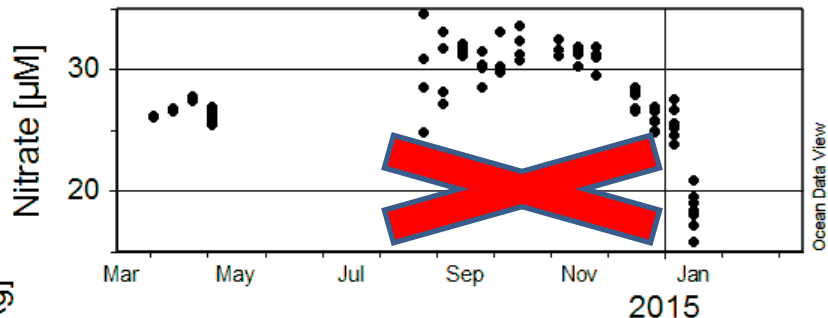
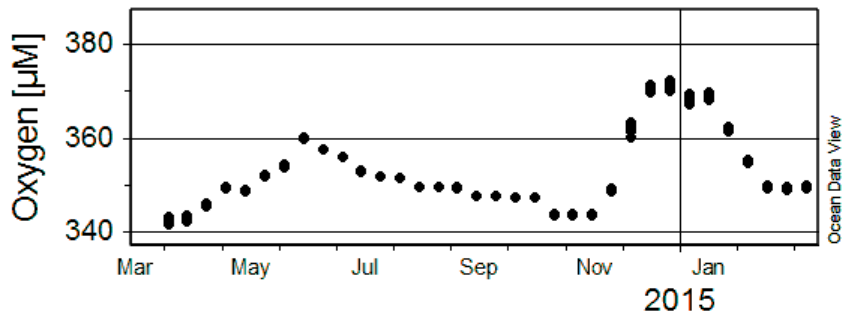
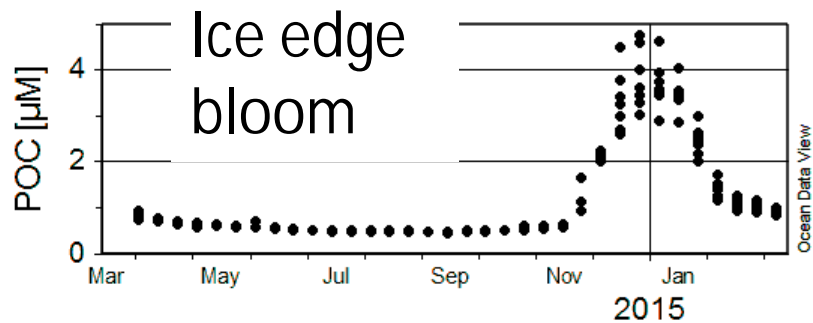
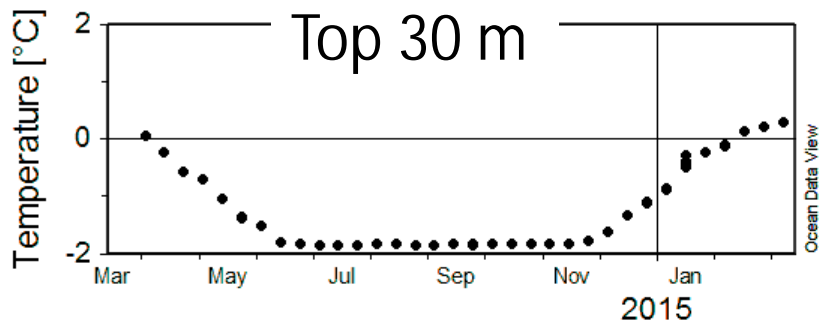
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Float
9254



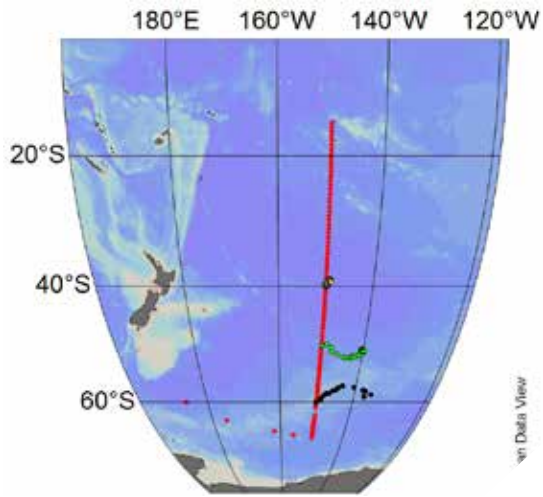
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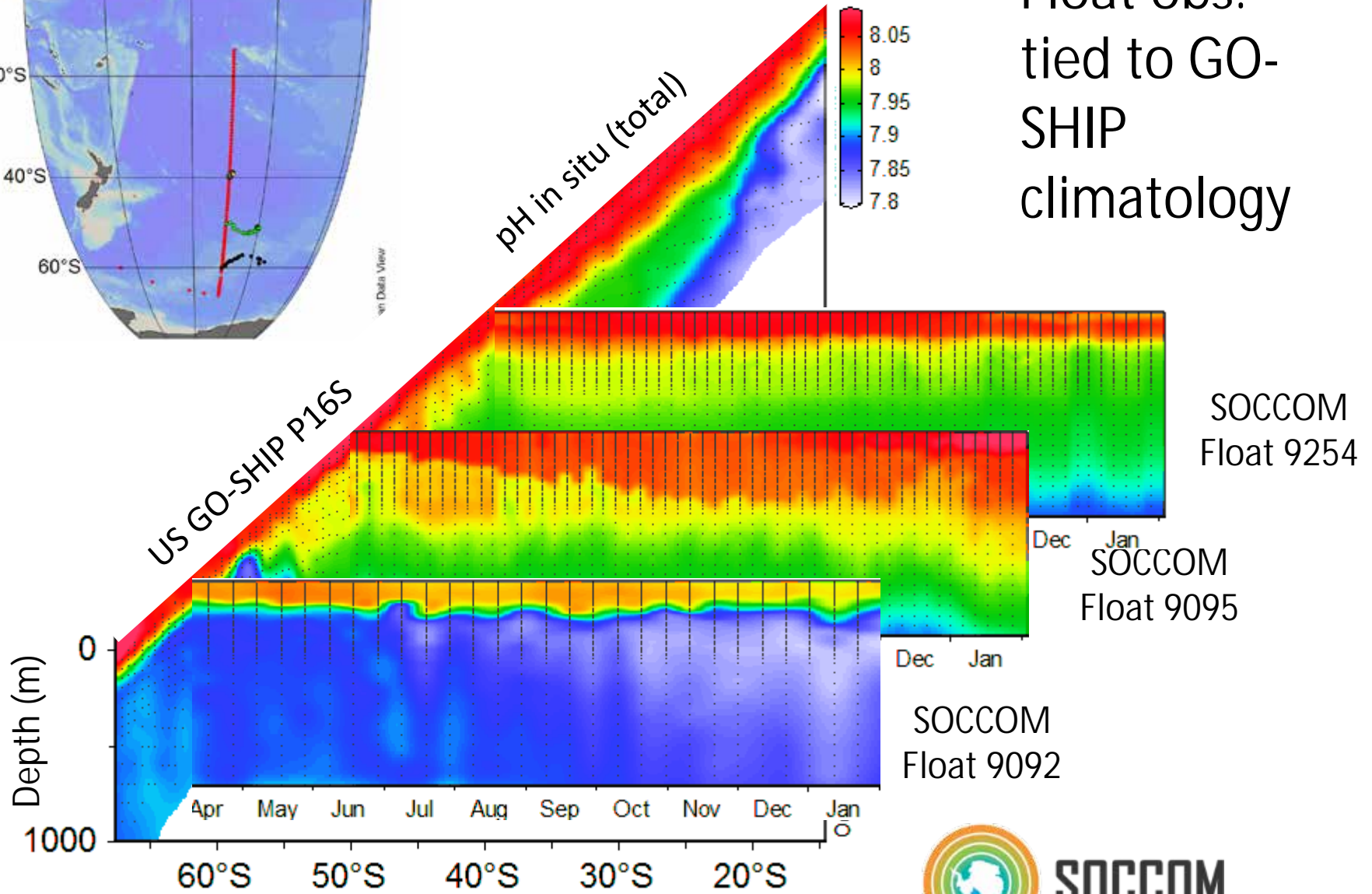
Float
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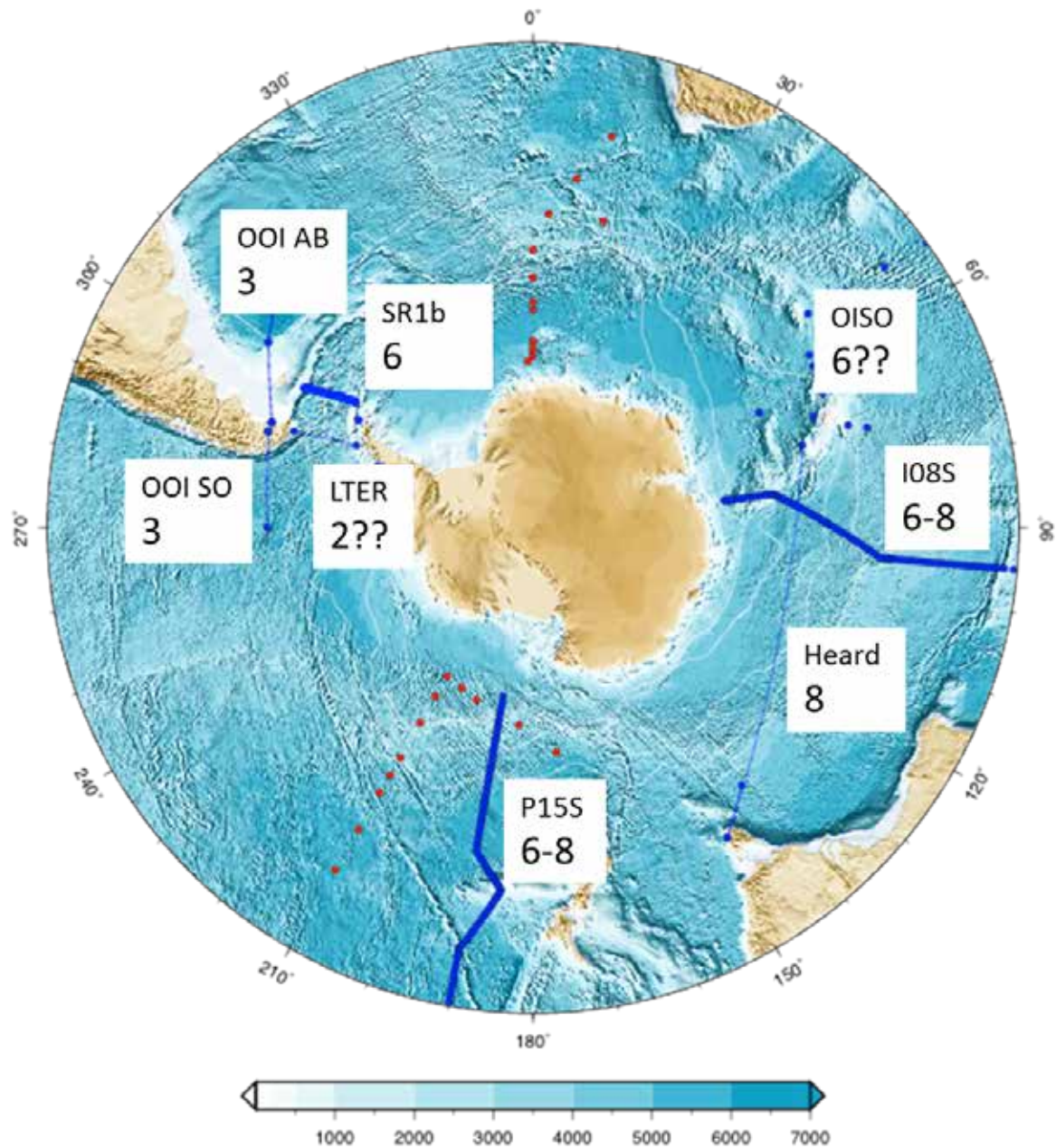


Float obs.
 tied to GO-
 SHIP
 climatology



SOCCOM Yr 2
37 floats available.
Many cruise
opportunities have
been identified.
Locations TBD.

A transformative
understanding of
Southern Ocean
carbon cycling and
climate.



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