Spatial variation of total alkalinity and total inorganic dissolved carbon along the Brazilian continental shelf-break and slope

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CO_2 net fluxes along south and southeast Brazilian continental shelf and slope

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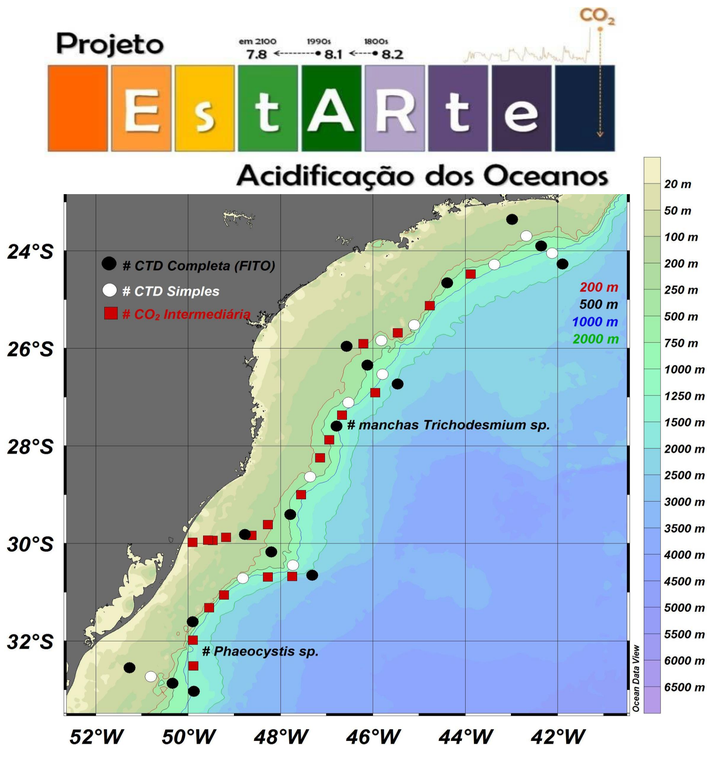
Background

- Rapid increase of CO_2 in the atmosphere is affecting the global climate (absorption of CO_2 by the ocean).
- Continental margins play an important role in biogeochemical cycles.
- Lack of long-term measurements of carbonate system parameters along Brazilian continental shelf and slope.

Methods



- Early spring 2014.
- Seawater samples in entire water column (Figure 1).
- CO_2 molar fraction (xCO_2) continuous measurements (GO-8050 / LiCOR LI-7000).

Figure 1: Study region. Position of hydrographic stations devloped durring EstARte-Sul cruise. Bathymetry in colour scale.

- Temperature and Salinity – CTD SBE 9plus.
- Total alkalinity (A_T) and total dissolved inorganic carbon (C_T) – potentiometric titration in a closed cell (Dickson, 2007).
- CO_2 partial pressure (pCO_2) was calculated using continuous xCO_2, T and S.
- CO_2 net fluxes was determined using wind speed from ECMWF reanalysis project – based on Takahashi *et al*. (2009) transfer coefficient (FT09).

References

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This study contributes to the Brazilian Ocean Acidification Network activities – www.broa.furg.br

Findings

It was possible to identify six water masses in the water column (Figure 2). A_T values ranged between 2248 and 2470 µmol kg^{-1} (Figure 2a). C_T values ranged between 1980 and 2444 µmol kg^{-1} (Figure 2b).

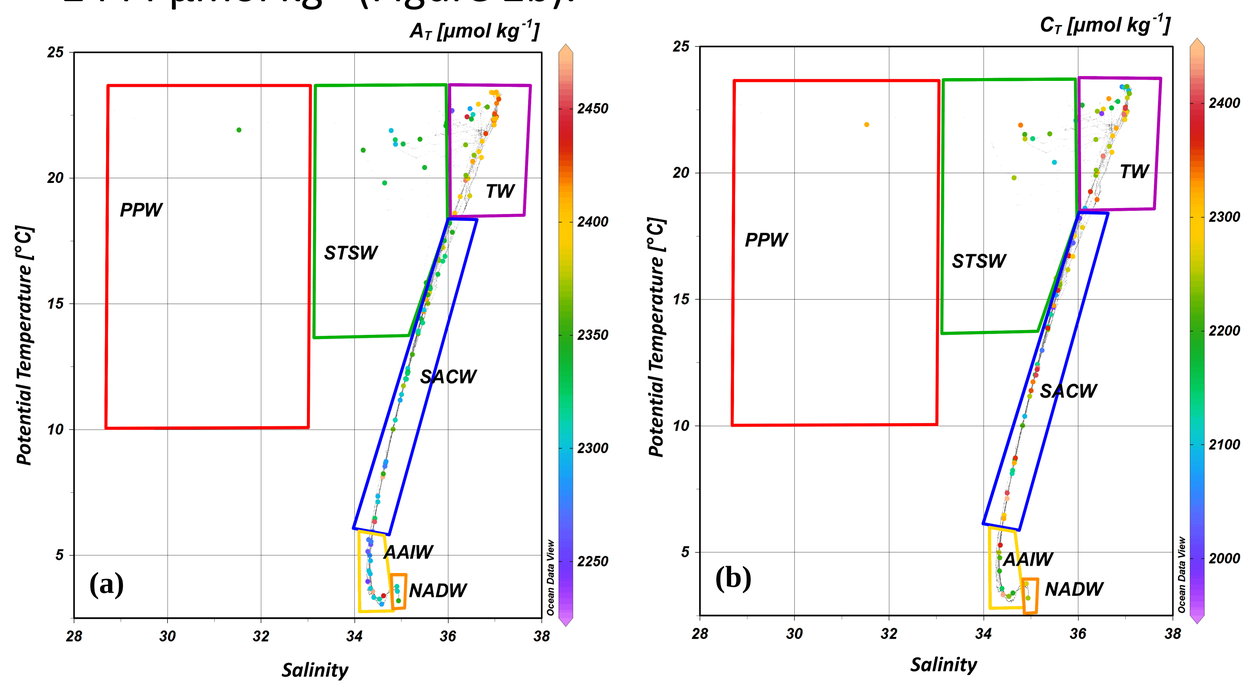

Figure 2: (a) θ/S-A_T and (b) θ/S-C_T diagrams. Water masses are indicated by coloured polygons and their acronyms are: **P**lata **P**lume **W**ater, **S**ubtropical **S**helf **W**ater, **T**ropical **W**ater, **S**outh **A**tlantic **C**entral **W**ater, **A**ntartic **I**ntermediate **W**ater, and **N**orth **A**tlantic **D**eep **W**ater.

FCO_2 average value was -87.9 ± 41.8 µmol m^{-2} d^{-1}.

A senescent bloom of *Trichodesmium spp* was observed, resulting in high pCO_2sw values achieving 873 µatm (ΔCO_2 of 476 µatm), being one of the three regions along the slope where CO_2 was released to the atmosphere (Figure 3).

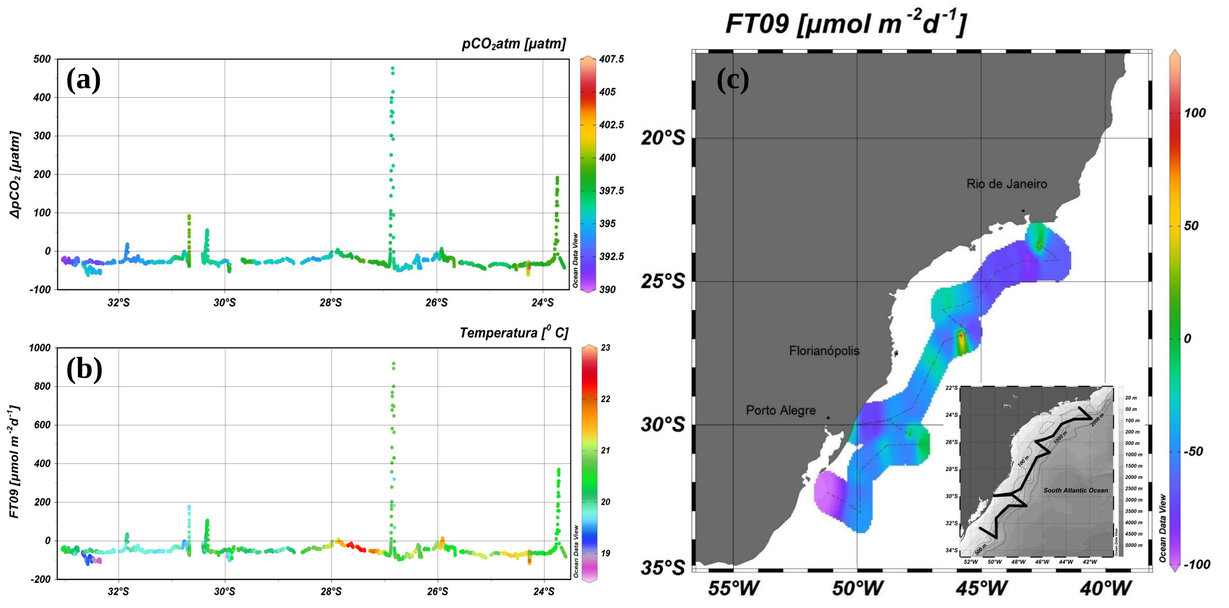

Figure 3: Surface results. (a) ΔpCO_2 (µatm) cruise data. Colour indicates atmospheric pCO_2 (µatm). (b) FT09 (µmol m^{-2} d^{-1}). Colour indicates temperature (°C). (c) FT09 (µmol m^{-2} d^{-1}) along cruise, without considering two peaks of emission.

Conclusion

A qualitative comparison with available database shows higher values of A_T and C_T for these data, reinforcing the need for more sampling efforts.

Furthermore, in the spring of 2014, the continental shelf was shown as a CO_2 sink, and biological effect was considered the main factor to characterize this behaviour.