

Carbonate system parameters monitoring in coastal waters of Chile

Rodrigo Torres ^{1,2}, Patricio Manriquez ³, Emilio Alarcon ^{1,4}, Jose Luis Iriarte ^{2,4,5},
Maximiliano Vergara ⁶, Silvia Murcia ⁷, Ernesto Davis ⁸, Jorge Navarro ², Madeleine Hamamé ¹.

¹ Centro de Investigación en Ecosistemas de la Patagonia (CIEP), Coyhaique, Chile. ² Centro de Investigación: Dinámica de Ecosistemas Marinos de Altas Latitudes (IDEAL), Valdivia, Chile. ³ Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Coquimbo, Chile. ⁴ Universidad Austral de Chile, Puerto Montt, Chile. ⁵ COPAS, Universidad de Concepción, Concepción, Chile. ⁶ Programa de Doctorado en Ciencias de la Acuicultura, Universidad Austral de Chile, Puerto Montt, Chile. ⁷ Universidad de Magallanes, Punta Arenas, Chile. ⁸ CEQUA, Punta Arenas, Chile.

Abstract

The spatial variability of surface water ΔpCO_2 of the greater part of the South American west coast (Fig.1), suggest two contrasting systems: (1) Coastal upwelling ecosystem (2) Coastal fjord ecosystems. The first is characterized by strong CO_2 outgassing, and the other one by strong CO_2 uptake during warm periods (Fig.1). These two systems, also show differences in the frequency of the periods of high surface seawater pCO_2 . While an open shore (fully exposed to the SW winds) upwelling area (2) is characterized by **intra-seasonal variability**, The Patagonian Archipelago (3) shows a marked **seasonal variability** in surface water pCO_2 .

Experimental work aimed at estimating the effect of increasing levels of atmospheric pCO_2 on west coast South American biota has been largely based on perturbation experiments using constant pCO_2 levels. However, coastal surface water pCO_2 in this region varies at different time scales (seasonal or intra-seasonal periodicities). Our goal is to understand the periodic fluctuations of high pCO_2 that is most relevant for OA on marine biota?

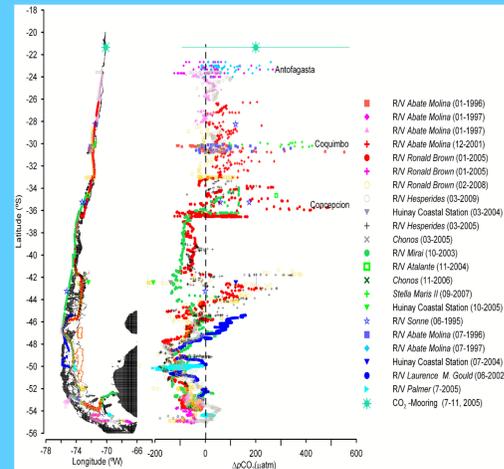
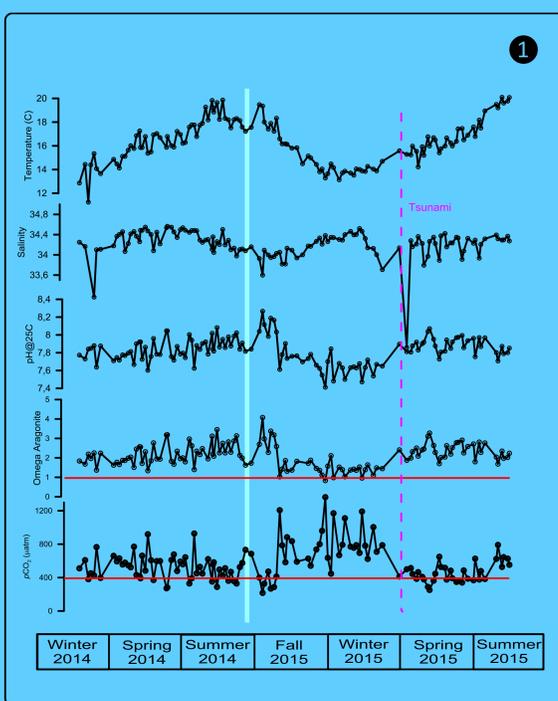
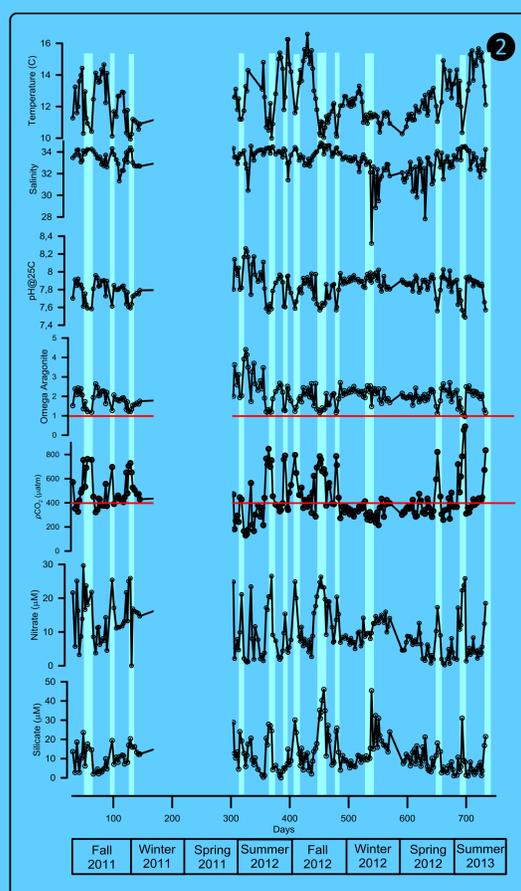


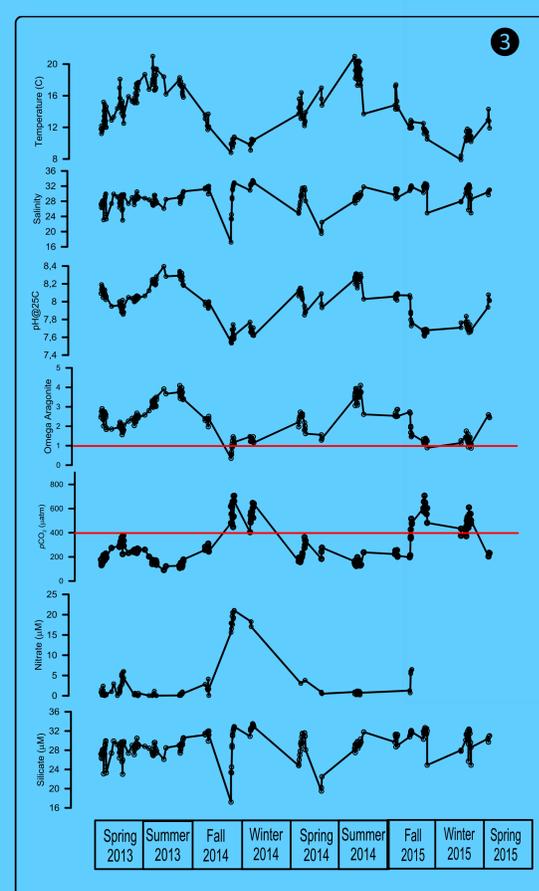
Fig 1. The air-surface water CO_2 gradient (ΔpCO_2) off the Chilean coast. (Torres et al., 2011)



Herradura Bay (30°S), inner waters at the upwelling area, Scallop farm.



Calfuco (40°S), wind exposed coast upwelling area.



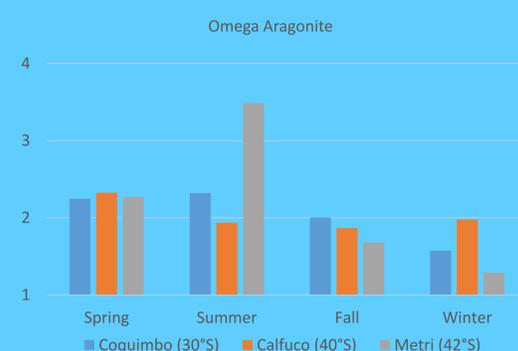
Metri (42°S), North Patagonia Inner waters, Blue mussel farm. (also see poster 43)

Methods

Surface seawater samples were collected directly at the intertidal zone of three locations at 30°S, 40°S and 42°S. Sampling frequency was approximately 2-3 days per week, with the exception of the 42°S location which is a compilation of various sampling expeditions of about 1-2 weeks in which samples were collected 1-2 times per day. pH, A_T , temperature and salinity were measured immediately in seawater samples soon after collection.

Findings

While year around events of very low pH characterized the exposed coast of an upwelling area (40°S, 2), the Northern Patagonia inner water (42°S, 3) is characterized by a sustained seasonal drop in pH during winter time. An intermediate situation occurs in coastal upwelling inner waters (Herradura Bay at 30°S, 1) in which a stronger seasonal signal is evident, probably related to summer stratification and longer residence time.



Seasonal average of omega aragonite in surface coastal water at 30°, 40° and 42°S

Conclusions

Different patterns of coastal water CO_2 variability along Chile, highlight the importance of including this variable (periodic fluctuations) in the design of perturbation experiments, in order to have a more realistic assessment of the effect of OA on marine biota along the South America west coast.

Acknowledgments

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