Oxygen dynamic in the Eastern South Pacific OMZ

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The eastern South Pacific holds one of the largest and most intense oxygen minimum zones (OMZ) of the world. This region also sustains a very high productivity and a unique ecosystem constrained by low oxygen concentration. To analyze the temporal evolution of the OMZ and relevant processes related to its biogeochemistry a monthly, ship-based, oceanographic time series have been maintained over the continental shelf off central Chile (~36.5º S) since 2002 [1]. During the last 2 years moored instruments have been added to this initiative including an ADCP to measure currents in the water column, and sensors of temperature and oxygen. Additionally several oceanic glider sections have been carried out along the same region.

Dissolved oxygen over the continental shelf is very low (typically lees than 0.5 mL L^{-1}) immediately below the mixing layer. Its temporal variability shows a marked seasonal pattern, mainly driven by upwelling events that predominate during austral spring-summer. The mechanism by which upwelling drives mid-water anoxia is not well known, but is greatly related to the supply of fresh nutrients to the photic zone, and to the advection of low-oxygen water from the north. Winter oxygen concentrations are usually larger in the water column and are related to downwelling events and to the increasing of fresh water discharge. These phenomena related to the dissolved oxygen variability off central Chile are discussed in this work based on observational evidences.

Data from moored instruments shows an interesting pattern that suggests upwelling (and downwelling) events affect oxygen concentration in “pulses” that occur in a temporal scale of days. Oxygen budget for the upper and lower layer of the water column shows that biological oxygen production in the mixed layer during spring-summer is almost equilibrated by biological oxygen consumption. Preliminary modeling results of the oxygen dynamics are also discussed.

[1] Ulloa, O. and S. Pantoja (2009) *Deep Sea Research Part II:* **56** 987-991 [2] Paulmier, A., D. Ruiz-Pino, V. Garçon, and L. Farías (2006) *Geophysical Research Letters* **33** L20601, doi:10.1029/2006GL026801

What real constraints do cherts bring on precambrian surface temperatures?

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The extent of surface temperature change during the Precambrian is one of the key questions for the evolution of the Earth and the development of life. Solar physics dictates that the luminosity of the Sun was 25-30‰ lower than today in the early archean [1, 2]. Archean surface temperatures above the freezing point of water, as indicated by marine sediments of that age, were likely the result of enhanced concentration of greenhouse gases and/or decrease in Earth albedo or both [3, 4]. The low $\delta^{18}O$ values discovered in archean cherts of presumably marine sedimentary origin can be interpreted as reflecting very high surface temperatures 55-85°C during this period [5 and refs therein]. Contradictory lower temperatures have been infered from cherts and from thermodynamic stability fields of other minerals [6, 4]. Studies of Si isotopic compositions of cherts [7] and of micrometer scale distribution of $\delta^{18}O$ and $\delta^{30}Si$ values [8] allow to add independant constraints on seawater temperature and to define quantitative criteria to assess the origin of cherts (sedimentary or not) and the preservation of their isotopic signature. In addition it allows to propose a way to correct the inferred seawater temperature from isotopic fractionation taking place during the formation of chert upon diagenesis. Germanium concentrations (the partitioning of Ge between quartz and fluid is temperature dependant) in precambrian cherts show a range from ≈ 0.1 to ≈10 ppm (this study) which adds potentially another dimension to constrain the silica cycle and seawater temperatures in the precambrian.

[1] Gough D. O. (1981) *Sol. Phys.* **74**, 21-34. [2] Minton D. A. and Malhotra R. (2007) *Ap. J.* **660**, 1700-1706. [3] Kasting J. F. (1993) *Science* **259**, 920-926. [4] Rosing M. T. *et al*. 2010) *Nature* **464**, 744-747. [5] Knauth L. P. (2005) *Paleo3* **219**, 53-69. [6] Hren M. T. (2009) *Nature* **462**, 205-208. [7] Robert F. and Chaussidon M. (2006) *Nature* **443**, 969-972. [8] Marin J. *et al*. (2010) *Geochim. Cosmochim. Acta* **74**, 116-130. [8] Marin-Carbonne J. *et al*. in prep.