

Biogeochemical behaviour of Cd and Zn in eastern-boundary OMZs

G. F. DE SOUZA^{1*}, M. SIEBER¹, T. M. CONWAY² AND D. VANCE¹

¹ ETH Zurich, Institute of Geochemistry and Petrology, Clausiusstrasse 25, 8092 Zurich, Switzerland (correspondence: desouza@erdw.ethz.ch)

² College of Marine Science and School of Geoscience, University of South Florida, USA

The trace metals zinc (Zn) and cadmium (Cd) act as micronutrients for marine phytoplankton. Building on the improved characterisation of their marine distributions thanks to GEOTRACES [1], recent studies have shown that, as for the macronutrients, the Southern Ocean plays a key role in determining their large-scale distribution [2-6].

However, with a limited amount of data from within the Southern Ocean itself, it has thus far been difficult to assess the extent to which Southern Ocean Zn and Cd signatures are modified by low-latitude cycling. The high elemental cycling fluxes associated with eastern-boundary upwelling systems, and their underlying oxygen minimum zones (OMZs), make these regions ideal locations for studying how major and trace nutrient elements behave during low-latitude cycling.

Here, we combine new high-resolution data from a circum-Antarctic Southern Ocean expedition [7,8] with published GEOTRACES datasets of Zn and Cd distributions that extend from well-oxygenated waters into the OMZs of the eastern South Pacific and the eastern North Atlantic [9-11]. Doing so allows us to examine the evidence for postulated sinks of these metals under low-oxygen conditions [12,13] and characterise their OMZ cycling behaviour in more detail than has previously been possible. We show that the accumulation of Cd in the water column of OMZs is considerably larger than that of Zn, and that whilst evidence for an OMZ sink of Zn remains equivocal, it is possible to resolve the contrasting influences of regeneration and OMZ sinks on the elemental and stable isotopic distributions of Cd.

[1] Schlitzer *et al.* (2017) *Chem. Geol.* **493**, 210-223 [2] Baars *et al.* (2014) *L&O* **59**, 385-399 [3] Wyatt *et al.* (2014) *GBC* **28**, 44-56 [4] Sieber *et al.* (in press) *Chem. Geol.* doi: 10.1016/j.chemgeo.2018.07.021 [5] Vance *et al.* (2017) *Nature Geosci.* **10**, 202-206 [6] Weber *et al.* (2018) *Science* **361**, 72-76 [7] Sieber *et al.* (in prep.) [8] Sieber *et al.* (in prep.) [9] John *et al.* (2018) *Mar. Chem.* **201**, 256-262 [10] Conway & John (2015) *GCA* **148**, 269-283 [11] Conway & John (2014) *GBC* **28**, doi: 10.1002/2014GB004862 [12] Janssen *et al.* (2014) *PNAS* **111**, doi: 10.1073/pnas.1402388111 [13] Janssen & Cullen (2015), *Mar. Chem.* **117**, 124-133.