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Boron isotopes in deep sea corals over the last 10,000 years: evidence of ocean acidification at 750m of depth?

Eric Douville (1), Pascale Louvat (2), Jerome Gaillardet (2), Cecile Gonzalez (1), Norbert Frank (1), and Marion Gehlen (1)

(1) Laboratoire des Sciences du Climat et de l'Environnement, LSCE/IPSL, UMR 8212 CEA-CNRS-UVSQ, 91198 Gif/Yvette, France (Eric.Douville@lsce.ipsl.fr), (2) Institut Physique du Globe de Paris (IPG-Paris), Laboratoire de Géochimie et de Cosmochimie, 1rue Jussieu, 75238 Paris cedex 05, France

Ocean acidification is a potential important threat to marine calcifying organisms such as framework-forming deep water corals. However, little is known about the pre-industrial natural variability of sea water pH at intermediate depth where such corals develop. The present study, carried out within the framework of the European project EPOCA, aims at the quantification of the natural variability of the B-isotopic composition, along with the identification of trends which may be related to ocean acidification. To this end, we analyzed the boron isotopic composition and trace elements of modern and well dated fossil corals originating from intermediate depth (500-900m) in the northeast Atlantic (southwest Rockall Bank). We have further tested the sensitivity of B-isotopes and B/Ca regarding temperature variations through a preliminary study of modern Lophelia pertusa corals covering a wide range of ambient sea water temperatures from 5° to 14°C. Boron isotopes were measured by multi-collector ICPMS (Neptune) with an external reproducibility of 0.25 permil and yield a relatively stable mean value of 28.2 +/- 1.0 permil for corals from Rockall Bank and over the course of the past 10,000 years. In contrast, the most modern samples from the same location revealed a clear fall of delta11B values with values systematically lower than 27 permil. Despite of the fact that the boron isotope levels observed here for deep sea corals are higher than values expected for aragonite based on theoretical assumptions on the delta11B-pH technique for cold waters, such a spectacular decrease may in fact be attributed to ocean acidification over the recent industrial era.