Different CO₂ history recorded in boron isotope ratio of two surface dwelling planktonic foraminifers

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During the last deglaciation (ca. 19 – 11 ka), partial pressure of CO₂ (pCO₂) of the atmosphere increased by ~80 μatm. Many paleoceanographers point out that the ocean had played an important role in atmospheric CO₂ rise, since the ocean have 60 times larger capacity to store carbon compared to the atmosphere. However, evidence on where carbon was transferred from the ocean to the atmosphere is still lacking, hampering our understanding of global carbon cycles in glacial-interglacial timescales. Boron isotope of skeletons of marine calcifying organisms such as corals and foraminifers can pin down where CO₂ source/sink existed, because boron isotopes of marine calcium carbonates is dependent on seawater pH, from which pCO₂ of the past seawater can be reconstructed. In previous studies using the boron isotope technique, Martinez-Boti et al. (2015, Nature) and Kubota et al. (2014, Scientific Reports) revealed that central and eastern parts of the equatorial Pacific acted as a CO₂ source (i.e., CO₂ emission) during the last deglaciation, suggesting the equatorial Pacific's contribution to atmospheric CO₂ rise. However, some conflicting results have been confirmed in a marine sediment record from the western part of the equatorial Pacific (Palmer & Pearson, 2003, Science), making the conclusion elusive. In this presentation, we will show new boron isotope records for the last 35 ka on two species of surface dwelling foraminifers (Globigerinoides ruber and Triloculatus sacculifer) which was hand-picked separately from marine sediment core recovered from the West Caroline Basin (KR05-15 PC01; 0.1°S 139.5°E) (Yamazaki et al., 2008, GRL). Two records showed different time history, namely surface pCO₂ reconstruction from boron isotope ratio of G. ruber shells showed steady increase in close equilibrium with atmospheric pCO₂, but that from T. sacculifer did not. This results suggests that, at least in this study area, T. sacculifer shells with sac chamber convey subsurface information rather than surface one.