Rapid decline in pH of coral calcification fluid due to incorporation of anthropogenic CO_2

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Marine calcifying organisms such as stony corals are being threatened by rapid ocean acidification due to the oceanic uptake of anthropogenic CO_2 [1, 2]. To better understanding how organisms and ecosystems will adapt to or be damaged by the resulting changes in environments, field observations are crucial. We report results of boron isotopic ratio ($\delta^{11}B$) measurements [3–5] of *Porites* corals within the western North Pacific Subtropical Gyre at two separate locations, Chichijima (Ogasawara Archipelago) and Kikaijima. Corals from each location exhibit a rapid decline of $\delta^{11}B$ since 1960, suggesting decreases of pH of calcification fluid (pH_{CF}). The stable carbon isotopic ratio ($\delta^{13}C$) of the corals also behaves in similar fashion and is consistent with the $\delta^{13}C$ of atmospheric CO_2 records (the ^{13}C Suess effect), indicating both $\delta^{11}B$ and $\delta^{13}C$ decreases are anthropogenic in origin. When compared to pH in ambient seawater (pH_{SW}) near these islands [6], results indicate that pH_{CF} has been changing sensitively to pH_{SW}. This suggests that the calcification fluid of corals will become corrosive to aragonite in the future at an earlier point than previously expected, despite the pH_{CF} up-regulation mechanism of coral [7, 8].

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