



A long-term observation of metabolic changes of a coral incubated in a continuous-flow complete-mixing experimental system

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We have conducted a long-term coral incubation experiment using a continuous-flow complete-mixing (CFCM) experimental system to study the impacts of high seawater temperatures on a coral's metabolisms. The CFCM system is a newly designed experimental system, which is a combination of a chamber incubation system and a flow-through system. The CFCM experimental system is designed so that it minimizes the stress a closed experimental system may impose on the coral, and at the same time it enables us to obtain quantitative data on the coral's daily metabolic changes under well controlled experimental conditions (e.g. light conditions, seawater temperatures, nutrient levels, etc.). Our incubation experiment lasted 25 days and showed that when the seawater temperature was maintained at 27 °C, the metabolisms of the coral were relatively stable, indicating that the coral did not suffer significant stress by being in a glass incubation tank. We have observed clear increase of pH and decrease of total alkalinity during the light periods (when a light of a fixed intensity was shone), and clear decrease of pH and increase of total alkalinity during dark conditions. When we gradually raised seawater temperatures from 27 °C to 31 °C, we observed sudden large release of ammonium ion, increase of respiration rates, and decrease of calcification rates. We propose to use the CFCM experimental system as a tool for quantitative investigation of corals' metabolic changes. With the CFCM experimental system, we can further investigate impacts of various environmental factors such as nutrient levels, UV-light intensity levels and seawater temperatures on different coral species under

the same controlled experimental conditions.