Quantifying and understanding the variability in carbon cycling on a fringing coral reef in Onna-son, Okinawa

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Coral reef ecosystems are experiencing increasing pressure due to anthropogenic disturbances including ocean warming and acidification. These disturbances may affect rates of organic carbon production and calcification on coral reefs, altering the partitioning of carbon between different reservoirs on reefs. Monitoring the natural variability of organic and inorganic carbon pools in the seawater of these ecosystems can shed light on how they may respond and transform under environmental change. In this work, the seawater carbon chemistry of a fringing coral reef in Onna-son, Okinawa was investigated. The study site presents an interesting case owing to the presence of seaweed and coral farms, both maintained by the local fisheries cooperative, that may increase the resistance and resilience of the reef to anthropogenic disturbances. Here we present preliminary measurements of dissolved organic carbon (DOC), dissolved oxygen (DO), particulate organic carbon and nitrogen ([C], [N], $\delta^{13}C$, and $\delta^{15}N$) paired with drifter tracks and flow velocities collected over the course of three weeks in October 2019. DOC values were found to range from 52.81 to 74.09 μM across four spatial surveys, with DO values ranging from 5.5 to 9.1 mg/L. Preliminary analyses show that DOC concentrations were higher when reef seawater residence time was lower, though no spatial trend in DOC is immediately apparent. The results of this descriptive study can inform coral reef monitoring efforts and bolster our understanding of how coral reef seawater chemistry and ecosystem community structure will transform in the future.

Keywords: Coral reef, Carbon cycling, Biogeochemistry

