Isotopes, Genes, and Technology

The Past, Present and Future of Corals

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Rising atmospheric CO_2 and its equilibration with surface ocean seawater is lowering both the pH and carbonate saturation state of the oceans. Numerous calcifying organisms, including reef-building corals, may be severely impacted by declining aragonite and calcite saturation, but the fate of coral reef ecosystems in response to ocean acidification remains largely unexplored. Naturally low saturation low pH groundwater has been discharging for millennia at localized submarine springs (called ‘‘ojos’’) at Puerto Morelos, Mexico near the Mesoamerican Reef. This ecosystem along with informatin from the fossil record provide insights into potential long term responses of coral ecosystems to low saturation conditions. In-situ geochemical and biological data indicate that both coral species richness and coral colony size decline with increasing proximity to low-saturation, low-pH waters at the ojo centers. Calcification rates also drop at the low pH springs. The ability of these scleractinian coral species to grow at undersaturated conditions emphasize the need to better understand the mechanisms of calcification and ability of corals to acclimate or adapt to future conditions to more accurately in order to predict future impacts of ocean acidification. To that end we are investigating the genetic response to acidification using in situ transplantation experiments. This information will be instrumental for desinging diverse stratagies to protect corals and ensure their survival in the future.