

Why is BEACON in Bermuda?

Bermuda is a highly important and suitable location to study the effect of ocean acidification on coral reef ecosystems owing to several factors, including:

- **Location:** Because the concentration of carbonate ions (important for the production of calcium carbonate) is already low in the waters surrounding Bermuda, the corals growing here will reach thresholds where they have difficulty forming their skeletons before corals living at lower latitudes. Thus, the coral reefs in Bermuda may act at the "canary in the coral mine" in terms of the effects of ocean acidification on tropical and subtropical coral reef ecosystems.
- **No major industries or sources of pollution:** The absence of big industries and major sources of pollution has allowed the coral reef ecosystem in Bermuda to remain relatively healthy compared to other reefs around the world. Consequently, any changes observed in the health of Bermuda's reefs are most likely due to large-scale global changes in temperature and carbon dioxide concentration in the atmosphere.
- **Natural gradients in seawater:** The carbon dioxide in seawater increases, and the acid-base balance changes in favor of increasing acidity, as you move across the Bermuda reef platform from the outer edge of the reef toward the island of Bermuda. This gradient allows for valuable experiments and cross-comparisons of organisms' health and performance under varying levels of CO₂ and acid-base balances in a natural environment.
- **Ecosystem dominated by marine calcifiers:** Bermuda's benthic marine ecosystem is dominated by calcifying organisms, including corals, coralline and calcifying algae, foraminifera, echinoderms, barnacles, bryozoans, and others. The sediments comprise nearly 100% calcium carbonate material, ranging from calcite, aragonite, to both low and high levels of magnesium calcite. Even the island of Bermuda is primarily composed of limestone.
- **Bermuda Atlantic Time-series Study (BATS):** The BATS program, combined with the nearby Hydrostation "S" program, is the longest running open-ocean time series in the world. On a monthly basis scientists at BIOS return to the same location to measure properties such as temperature, salinity, dissolved oxygen, nutrient concentrations, chlorophyll pigments, and many other parameters. As a result, the waters surrounding Bermuda are well-characterized, and any observed changes can be attributed to biogeochemical processes on the reef.
- **Bermuda Institute of Ocean Sciences (BIOS):** The location, facilities, and expertise available at BIOS allow ready access to the reef, instrumentation required to characterize the complete CO₂ system, nutrients, chlorophyll pigments, coral growth, and knowledge in areas covering coral reef ecology, carbonate geochemistry, and chemical, biological, and physical oceanography.