191-5 - Booth No. 143: 2023 WAS A YEAR LIKE NO OTHER: DIFFERENT STORIES FROM IN-SITU AND SATELLITE DATA AT CORAL GARDENS, BELIZE

Tuesday, September 24, 2024

8:00 AM - 5:30 PM

Hall D (Anaheim Convention Center)

Booth No. 143

Abstract

The endangered staghorn coral (*Acropora cervicornis*), previously abundant in some shallow reefs in northern Belize, experienced total coral loss following the anomalously warm summer of 2023. Important framework-builders for many Pleistocene and Holocene Caribbean reefs, these corals persisted at Coral Gardens through the Caribbean-wide die-off of the 1980's, and several recent El Nino events (e.g., 1997-98, 2014-16). Here, we compare data from in-situ and satellite sensors to better understand the temperature history at Coral Gardens over a range of time-scales and using different instruments.

During 2023, sea-surface temperatures (SST) measured once-daily by satellite sensors (5 km resolution) at Coral Gardens increased earlier (May), peaked higher, and stayed elevated longer (Nov) than during any previous year since 1985 when satellite data became widely available. The minimum monthly mean temperature during 2023 occurred in February (26.9 °C), almost a degree warmer than the baseline measure (25.9 °C during 1985-1990 and 1993) for this area. The maximum monthly mean (MMM) temperature occurred during October and was nearly 2°C warmer than the September maximum of the baseline reference period (30.6 and 28.9 °C, respectively), and MMM remained elevated above previous years until November 2023. Here we show seasonal, multi-day, and daily variations in heating and cooling. Day-to-day changes in temperature rarely exceeded 1 °C.

We also monitor water temperatures at Coral Gardens using in-situ data loggers (3-5 depth) at 0.25-1.0 hour intervals. Daily minima in the in-situ records typically agree with daily satellite SST, but daily maxima are typically 1-3 °C higher, indicating that average daily temperatures at Coral Gardens exceed those suggested by satellite SST by 0.3-0.5 °C. Data from the in-situ sensors also exhibit considerably more variable temperatures, including frequent periods of local heating and cooling indicated by elevated or depressed minima relative to satellite SST, complexities in the typical diurnal heating and cooling pattern, and daily differences in heating and cooling between nearby sensors that likely reflect short-term variations (cloud-cover, precipitation, wind, waves, and currents) in this shallow reef environment.

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