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Environmental Properties of Coastal Waters in Mamala Bay, Oahu, Hawaii, at the Site of a Future Seawater Air Conditioning Outfall

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DETAILED METHODOLOGY

Current Magnitude and Direction

A 300 kHz Workhorse ADCP (RD Instruments, Poway, CA) was deployed during the first deployment period). The instrument was programmed to continuously sample *u* (east-west), *v* (north-south), and *w* (vertical) as well as an error velocity from the near surface to the near bottom of the water column, every 12 seconds. The samples were arranged into averaged packages in 10-minute intervals, and the water column was sampled in 4 m bins. During the second deployment, a 300 kHz Sentinel V ADCP was deployed but malfunctioned.

Temperature, Salinity, Pressure, Turbidity, Fluorescence, and Oxygen

An SBE 16plusV2 CTD with an optical oxygen sensor and an ECO-FLNT turbidity/fluorescence sensor (Sea-Bird Electronics, Seattle, WA) was deployed throughout both data collection periods. Full data sets were collected except for oxygen in deployment one, where a faulty O-ring seal caused the instrument to fail. This package was programmed to sample data every 36 minutes. The turbidity and fluorescence readings, in volts, were converted to nephelometric turbidity units (NTU) and mg m^{-3} , respectively, using coefficients acquired during factory calibration based on turbidity and phytoplankton samples of known concentrations.

High-Frequency Temperature

A high-accuracy SBE 39 temperature sensor (Sea-Bird Electronics, Seattle, WA) included in the instrument package on both deployments, was programmed to sample every one minute. This higher resolution record was used to investigate short-period oscillations in temperature.

Nitrate

A SUNA nitrate sensor (Satlantic, Halifax, NS) was deployed during both data collection periods. For the first deployment, the sensor was programmed to report the average of 10 frames of nitrate data (~8 seconds of continuous readings) every 10 minutes throughout the three-month deployment. For the second deployment, the nitrate sensor was programmed to report 10-frame averages every one minute to investigate high-frequency nitrate variations and compare these variations to the 1-min temperature record.

Water Column Profiles

Three sites were selected for water column profiling: (1) a site upslope of the mooring near the top of the proposed diffuser at ~100 m, (2) a site near the mooring but slightly downslope at ~175 m, and (3) a site at the proposed seawater intake location at ~500 m depth (Figure 1). Data from these locations were collected throughout the water column via shipboard CTD casts on R/V *Kilo Moana* and R/V *Ka'imikai O Kanaloa*. The CTD profiler included dual SBE 3 and SBE 4 temperature and conductivity sensors (Sea-Bird Electronics), a pressure sensor (Sea-Bird Electronics), and auxiliary sensors measuring fluorescence (Eco-FLNT, Wetlabs), transmittance (Seapoint Turbidity Meter, Seapoint Sensors, Inc.), oxygen (SBE 43, Sea-Bird Electronics), photosynthetically active radiation (QSP-2350L, Biospherical), and nitrate (ISUS V3, Satlantic). Eight sampling cruises were conducted between October 2012 and May 2014 (Figure 1b). Bottle samples were collected at five to eight depths per cast, allowing calibration of the optically observed parameters.