## Abstract

The focus of our proposal is on the development of ocean climate indicators for the trade wind regions. The trade wind regions comprise a regime that covers ~50% of the ocean surface, and is a key component of the climate system where the surface layer of the ocean and the lower atmosphere interact extensively. We are targeting indices to quantifying the following: 1) the state and variability of the upper ocean, such as temperature, salinity and mixed layer, 2) the state and variability of the surface forcing, including the subseasonal, seasonal, annual, and longer time scale variability of the surface meteorology and air-sea fluxes 3) the stability of the upper ocean and its sensitivity to perturbation by the atmosphere, 4) the capability of the upper ocean to influence the atmosphere, as through the heat content of the upper ocean, 5) the statistical properties of the surface forcing and upper ocean and their modulation in time, including extrema, means, variance, histograms, and spectra, and 7) significant covariability between the surface forcing and the upper ocean, such as wind-driven transport.

Central to our effort will be utilization of data from three long-term Ocean Reference Stations (ORS): Stratus at 20°S, 85°W which has been deployed since October 2000, NTAS at 15°N, 51°W which has been deployed since March 2001, and WHOTS at 22.6°N, 158°W which has been deployed since August 2004. These three sites occupy three characteristic and, we believe, potentially diagnostic locations in the trade wind regime. They provide data of known quality, with high vertical and temporal resolution in the upper ocean, with co-located, climate-quality records of the surface forcing. We will validate the regional representativeness of these three sites and extend our results across the trade wind regime by utilizing the OA Flux, Argo float data, and HYCOM 1/25$^{th}$ degree ocean model fields. At the same time, we would use the ORS high temporal and vertical resolution data to examine any pitfalls that may be associated with using less well-sampled data sets to estimate the same indices and with using model-based analysis fields instead of observations.

With an understanding of the ability to compute indices from Argo and HYCOM we would investigate links between the indices at the three sites and patterns of variability across the trade wind regime and in regions within the trade winds. For example, we would look at ENSO and PDO modes of variability that might be isolated from the Pacific trade winds using empirical orthogonal functions (EOFs) and investigate how correlated their temporal variability is with indices based on the Stratus ORS. Or, we would examine to what degree Hawaii-regional indices, say of the local hydrological cycle, show correlation with indices from WHOTS.

We think that trade wind regional climate indicators will have value for diverse communities and would seek feedback during the project. These indices will be made available on our websites at WHOI and the University of Hawaii. They would also be shared via OceanSITES, the sustained ocean time series components of the ocean observing system, which maintains public access Global Data Assembly Centers (GDACS) at NOAA National Data Buoy Center and at CORIOLIS at IFREMER (Institut français de recherche pour l'exploitation de la mer) in France.