Integrated Boundary Current Observations in the Global Climate System

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Project Summary

Boundary currents (BC's) play a critical role in the climate system and in societal applications, since they carry a bulk of the ocean heat transport, are part of climate-controlling overturning circulations, exhibit the largest air-sea heat fluxes, and represent the most important coastal ecosystems and fisheries regions. In BC regimes the local responses and societal impacts from climate forcing are expected to be large (ocean acidification, health of the ecosystems, fisheries, recreation). Despite their importance, BC's around the world are not observed systematically, and this is one of the most critical gaps that were identified by the international community at the OceanObs09 conference in Venice.

The CORC project develops, demonstrates, and implements prototype BC observing systems that can fully monitor mass and heat transports and water properties of most boundary currents in a sustained and routine mode. CORC explores and exploits the complementarity of several technologies and techniques for which the PI's have expertise, and develops additional ones as needed. These include underwater gliders, moorings, inverted echosounders/bottom pressure sensors (PIES), XBT sections, surface drifters, data assimilating state estimation, together with ARGO and altimetry. New developments are routine subsurface data retrieval via gliders, bottom-released surface drifters, and improved data merging methods. CORC currently applies these developments in the southern California Current (CC) with ecosystem and fisheries relevance, and in the Solomon Sea (SS) where the highly variable flow impacts equatorial climate processes via the Undercurrent.

The supported activities include glider sections along 2 lines in the CC (typically every 3 weeks, physical/biological observations, upper 500m) and across the SS (every 6-8 weeks, physical, upper 700m), moorings (CC) and PIES (CC, SS) to provide high temporal resolution and to include deeper measurement, surface drifter releases in the CC, analyses to integrate boundary and interior observations, regional state estimates, and development of analysis methods and of technology.

The anticipated products and outcomes include:

- raw profile and binned section data from glider transects in the CC and SS
- mooring/PIES derived transport and high-frequency physical data
- long timeseries of currents and transports in the CC and SS
- in-situ cal/val data for satellite SST measurements
- indicators of the state and function of BCs in near-realtime
- state estimates and reanalysis of observations
- revised forcing products
- efficient BC observing techniques with quantification of performance
- assessment of physical climate forcing in BCs
- understanding how climate processes modulate BCs and how BCs impact climate
- published research.

The users/applications include climate modelers and forecasters (e.g. NAVO, JPL, SIO), disaster response (NOAA ERMA), ecosystem assessment efforts, fisheries researchers/managers, climate impact studies and mitigation, and the research community.