A Climatology of the California Underwater Glider Network

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Abstract (Oral Presentation)

Underwater gliders are well suited for sustained observations of boundary currents and their low-frequency variability. In the southern California Current System (CCS), continuous observations from 2006 to present by autonomous Spray gliders along CalCOFI lines 66.7, 80, and 90 constitute the California Underwater Glider Network (CUGN). Glider-measured physical variables, such as depth-averaged velocity, temperature and salinity, are processed into a comprehensive climatology. The CUGN climatology has several gridded products along each of the three lines: a mean field, an annual cycle, and the interannual anomaly from the annual cycle. Here an overview of the climatology is presented, as well as some scientific insights that it has revealed about the subsurface CCS physical environment. These include a high-resolution depiction of the shallow, equatorward California Current offshore and the subsurface, poleward California Undercurrent nearshore; isopycnal heave and shallow diapycnal mixing during upwelling season; and a semiannual intensification of the California Undercurrent. The observations also capture the persistent warm, downwelling anomalies of 2014–16 and a positive isopycnal salinity anomaly that peaked with the 2015-16 El Niño. The latter is indicative of a tropical influence via advection. The CUGN climatology is also used to evaluate the realism of a regional, data-assimilating general circulation model, the California State Estimate (CASE). The full four-dimensional CASE dynamically interpolates and extrapolates the physical fields off the CUGN lines; enables the calculation of cross-shore and vertical transports; and provides hypotheses of the physical mechanisms driving the glider-observed anomalies, including the 2014-2016 regional circulation and heat content changes. The combined use of the CUGN climatology data product and the regional model CASE proves to be effective for monitoring and interpreting the physical variability of the coastal CCS