



Transport of Ocean Waters between the Pacific Ocean and the Gulf of California

Curtis Collins (1), Ruben Castro-Valdez (2), Affonso Mascarenhas (2), and Tetyana Margolina (1)

(1) Naval Postgraduate School, Oceanography, Monterey, CA, United States (collins@nps.edu), (2) Universidad Autonoma de Baja California, Ensenada, Mexico

Ocean transports between the Pacific Ocean and the Gulf of California contribute to the seasonal heating and cooling of the Gulf and add high salinity waters to the surface and upper thermocline waters of the Pacific. These transports have been measured by 1) moored arrays of temperature, salinity and pressure instruments on either side of the entrance to the Gulf in water 130 m deep and 2) shipboard hydrographic measurements across the Gulf along a section between Sinaloa and Baja California. The moored measurements extended from November 2003 to May 2006 and the hydrographic section was occupied eighteen times between 1992 and 2013. Results of these measurements are described in this presentation.

The moored measurements resolved baroclinic transport at 40 and 80 dbar referenced to 120 dbar. Geostrophic flow was into (out) the Gulf from May to October (November to April). Mean transport into (out) of the Gulf at 40 dbar was $5.6 \times 10^3 \text{ m}^3/\text{s}$ ($4.2 \times 10^3 \text{ m}^3/\text{s}$) and at 80 dbar was $1.3 \times 10^3 \text{ m}^3/\text{s}$ ($1.8 \times 10^3 \text{ m}^3/\text{s}$). Maximum and minimum geostrophic velocities were observed about July 1 and December 1, respectively, and were about three times as large as the mean values.

Steric heights at the mooring locations were compared to satellite sea level height anomalies. Agreement was good and provided a more robust measure of the annual cycle of the mean surface geostrophic flow and transport because 9 years of continuous observations were available.

The hydrographic measurements indicated predominately cyclonic flow patterns with inflow along Sinaloa and outflow along Baja California. During periods of strong exchange, narrow deep jets were observed to develop over the continental slopes of Sinaloa and Baja California.

Overturning circulation within the Gulf is clearly indicated by the patterns of salinity along the hydrographic sections in which inflows of fresher Pacific waters ($S < 34.5$ on the 23.5 kg/m^3 isopycnal) along Sinaloa contrast with outflow of high salinity ($S > 34.8$ for densities between 25 and 26 kg/m^3) along Baja California. Geostrophic velocities for these sections are used to estimate the rate of the meridional overturning circulation within the Gulf.