



Structure of Ocean Circulation between the Galapagos Islands and Ecuador

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From March 27 to April 5, 2009, upper ocean velocities between the Galapagos Islands and Ecuador were measured using a vessel mounted ADCP. Strongest currents were observed immediately to the east of the Galapagos Islands. Here the surface flow in the upper 200 m was directed to the north over a southward flowing undercurrent. The northward flowing surface current had a maximum speed of 1.1 m/s, a mean speed of 0.3 m/s, and a transport of 11.4 Sv. The southward flowing undercurrent was only about half as wide as the surface flow but extended to at least the maximum depth of the ADCP measurements, about 700 m. The maximum undercurrent speed was 0.35 m/s, the mean speed was 0.1 m/s, and the transport was 8 Sv. Off the Ecuador Coast, south of 3°S and east of 84°W, surface flow (above 200 m) was directed southward and eastward into the Peru-Chile countercurrent. Shoreward of the beginnings of the Peru-Chile countercurrent (over the upper slope at the southern entrance to the Gulf of Guayaquil), surface currents were directed northward into the Gulf of Guayaquil. The total transport above 700 m between the Galapagos and Ecuador for the two sections were 8.2 and 1.2 Sv for the upper 700 m. Geostrophic transports for the two sections were 9.4 and 1.8 Sv.

The integral of the surface velocity between Ecuador and the Galapagos is shown to follow the trend of the sea level difference between the Galapagos and Ecuador indicating geostrophic balance. Annual sea level variability at Santa Cruz (Galapagos Islands) and La Libertad (Ecuador) is similar except for February and March when relative sea level at La Libertad is about 2 cm higher. A time series of sea level difference showed fluctuations of ± 5 cm of sea level difference for low frequency variability at periods between one and five years. El Niño periods corresponded to higher sea level at the Galapagos which should be related to increased northward flow.