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MODEL AND IN-SITU SALINITY VARIABILITY IN THE TROPICAL PACIFIC

Chun-Yi Lin[1] and Chung-Ru Ho[2]

The NOAA's Geophysical Fluid Dynamics Laboratory (GFDL) for climate model has been applied widely in the study of atmospheric and oceanic climate variability in the tropical oceans [Zhang et al., 2007]. Thermohaline circulation plays an important role in the Earth's heat budget and transports large amount of thermal energy. However salinity compared with temperature has been less discussed in global climate system. Unfortunately, in-situ salinity measurements in much of the world ocean are not frequently observed or if at all. We have examined both historical salinity profiles in a dataset consisting of a combination of the World Ocean Database 2009 and GFDL model predictions for the tropical Pacific from 1980 to 2008 [Zhang et al., 2007; Chang et al., 2011].

In order to get more detail about temporal and spatial salinity variability, the studies focus on changes in three specific areas, the whole tropical Pacific (30°N - 30°S; 120°E - 70°W), the western Pacific Warm Pool, and the South Pacific Convergence Zone. The result indicates that a clear freshening trend before 2000 and in contrast to the saltier trend after 2000 in the tropical Pacific, the western Pacific Warm Pool, and the South Pacific Convergence Zone. The comparison of model predictions with in-situ salinity measurements shows the use of model significantly decreases root mean square (RMS) differences as high as 10×10^6 J/m^2 and improves the correlation coefficient (r) as high as 0.1 for the tropical Pacific (Table 1) [Polito et al., 2000; Sato et al., 2000]. The obvious change of variability in the tropical Pacific is the decadal variability and the interannual El Niño-Southern Oscillation event which result in the hydrologic cycle for the precipitation, evaporation, and salt advection (Fig. 1).

Table 1 The correlation coefficient and RMS (in 10^7 J m^{-2}) between TAO buoy and altimeter data derived HSA with (model) or without haline correction.

Source	No Sal.		Model	
Location	r	RMS	r	RMS
(A) 0°N, 156°E	0.72	61	0.82	51
(B) 0°N, 170°W	0.87	46	0.87	46
(C) 0°N, 140°W	0.94	46	0.95	36

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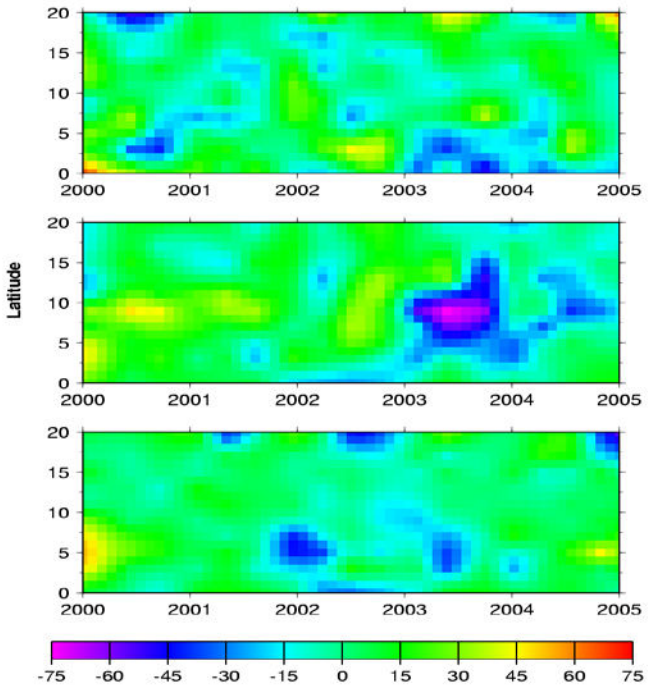

Figure 1 Time-latitude plot of HSAs changes with haline effect in units of 1×10^7 J/m^2 along (a) 156°E, (b) 170°W, and (c) 140°W for 2000-2004.

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