Interannual variability of the North Pacific Subtropical Countercurrent and its associated mesoscale eddy field

Bo Qiu
Dept of Oceanography, University of Hawaii

Abstract

Interannual changes in the mesoscale eddy field along the Subtropical Countercurrent (STCC) band of 18-25N in the western North Pacific Ocean are investigated with 16 years of satellite altimeter data. Enhanced eddy activities were observed in 1996-1998 and 2003-2008, whereas the eddy activities were below average in 1993-1995 and 1999-2002. Analysis of repeat hydrographic data along 137E reveals that the vertical shear between the surface eastward-flowing STCC and the subsurface westward-flowing North Equatorial Current (NEC) was larger in the eddy-rich years than in the eddy-weak years. By adopting a 2.5-layer reduced-gravity model, we show that the increased eddy kinetic energy level in 1996-1998 and 2003-2008 is due to enhanced baroclinic instability resulting from the larger vertical shear in the STCC-NEC's background flow. The cause for the STCC-NEC's interannually-varying vertical shear can be sought in the forcing by surface Ekman temperature gradient convergence within the STCC band. Rather than El Nino-Southern Oscillation signals as previously hypothesized, interannual changes in this Ekman forcing field, and hence the STCC-NEC's vertical shear, are more related to the negative Western Pacific index signals.