

Pacific decadal variability in the view of linear equatorial wave theory

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Abstract

In attempts to better understand the roles of the various components of the Tropical ocean circulation in a " $V'\bar{T}$ mechanism" of decadal variability [McPhaden and Zhang, 2002], we have used a simple model of the Tropical Pacific sea-surface temperatures, with linear, wind-forced dynamics and non-linear thermodynamics. It is shown that decadal wind-forcing alone is able to generate temperature fluctuation of about 0.25°C in the Eastern Equatorial Pacific (i.e. on the same order of magnitude as the 76/77 shift), without the need for any atmospheric retroaction. Contrary to the proposed mechanisms cited above, we find that the dominant terms in this budget are :

- the mean upwelling of subsurface temperatures anomalies associated with the thermo-cline motions
- zonal advection acting upon the large zonal SST gradients.

The anomalous meridional convergence is one of the smallest in the heat budget when considered acting directly upon the mean temperature gradient (the $V'\bar{T}$ term). However, it is crucial to the existence of thermocline depth anomalies, hence to subsurface temperature anomalies, by way of mass conservation.