



The Impact of Mean State on Central Pacific ENSO during the last decade

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El Niño/Southern Oscillation (ENSO) phenomenon lately appears to have a much fast pace with four warming events in the past decade (2002–2012). Three out of four events have their warming centers confined in the equatorial central Pacific. It is argued that the anomalous zonal sea currents are responsible for the fast transition of the central Pacific warming. Furthermore, based on the heat budget analysis, it is found that zonal advective feedback appears to play an important role in the phase transition of central Pacific ENSO, although the thermocline feedback process that is essential for ENSO, as delineated by the recharge/discharge oscillator theory, also contributes but mainly in the eastern Pacific.

A stability analysis is performed using a simple stripped-down coupled model with two different basic state settings derived from the periods over 1982–2001 and 2002–2012, respectively. In the two periods, the basic states show different distribution along the equator and the leading ENSO-like eigen-modes have very different periods and patterns. The mode under the basic state in the earlier period resembles the eastern Pacific ENSO with a period about 5 years, whereas under the basic state in the recent decade, the ENSO mode becomes more like the observed central Pacific ENSO with a period about 2 years. The slow eastern Pacific ENSO mode is dominated by the thermocline feedback and behaves more like the recharge oscillator, whereas the zonal advective feedback plays a significant role in the fast paced central Pacific ENSO mode. These results are roughly consistent with the broad features of two types of ENSO. In addition, the zonal advective feedback contributes to the phase transitions of both types of ENSO-like modes. In a word, the recent fast paced ENSO activities in the central Pacific is suggested due to the dominance of zonal advective feedback favored by the tropical Pacific basic state conditions in the past decade.