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Phase reversal and periodicity of the decadal and bi-decadal ENSO-like variabilities controlled by South Pacific Ocean

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Phase reversal mechanisms of the Pacific ENSO-like variability on decadal timescales are investigated based on a pair of the climate model experiments consisting of the control run (CTRL) and the partial blocking run (PB) where model temperature and salinity are restored to their climatological values near 10 degrees south in the South Pacific. In CTRL, positive anomalies in the tropics and negative anomalies in the North Pacific mid-latitudes are found in the first EOF mode of the sea surface temperature with significant decadal and bi-decadal periods. On the other hand, in PB, the former tropical signals are not appeared and only the mid-latitude signals are identified. It is robustly demonstrated that oceanic signals of the South Pacific origin are keys in maintaining the ENSO-like variability. By separating oceanic signals in CTRL into decadal and bi-decadal components, it is also shown that relatively faster oceanic wave adjustments triggered by changes of wind-stress curl in the South Pacific extra-tropics for the decadal and slower mean isopycnal advection of subsurface temperature anomalies associated with modification of South Pacific eastern subtropical mode water for the bi-decadal are essential in the phase reversal of respective periods. Periodicity of the decadal (bi-decadal) variability is determined mainly by propagation time of the oceanic subsurface signals from the South Pacific extra-tropics (mid-latitudes) to the tropics.

Keywords: PDO, decadal ENSO