

Triggering of strong El Nino events with meridional redistribution of convective sources by distinct down penetration of equatorial-quasi-biennial oscillation

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Gray et al. (1992, GRL, JMSJ) hypothesized a mechanism by which the equatorial stratospheric Quasi-Biennial Oscillation (QBO) of zonal winds actively modulates the timing of El Nino-Southern Oscillation (ENSO) events. The variable wind shear (in vertical direction) associated with opposing phases of QBO modifies the meridional distribution of convective sources, which ultimately leads to the development of warm El Nino events through the modification of regional east-west Walker and north-south Hadley circulations. Based on the analyses of the NCEP-NCAR reanalysis data in almost all the longitude zones of tropical region from 1948 to the present (January 2006), we report in the present work that when the stratospheric QBO penetrates down to below 50hPa level and influences the upper troposphere, modification of the meridional Hadley cell (particularly over India and Indonesia or west Pacific region) and the triggering of the strong El Nino events occur. Further, it is observed that the severity of the modification of the Hadley cell is associated with intensity of the El Nino events and the said both are closely associated with the intensity of the down penetrated QBO in zonal winds. The influence of the down penetrated QBO and the modification of the Hadley cells during strong El Nino events of global economic importance (like the ones happened in the years 1972/73, 1982/83 and 1997/98) are also manifested in the radiosonde data obtained over India as well as the other tropical regions and in the Indian MST radar data.