



Solar cycle modulation of ENSO variability

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Inspired by the work of Labitzke and van Loon on solar/QBO modulation in the stratosphere, Barnett (1989) conducted an investigation on the relationship between the biannual component of the sea surface temperature (SST) in the equatorial eastern Pacific and the solar activity. He found that the amplitude of biannual component of the SST (BO) is modulated by the 11-year solar cycle: the amplitude of the BO is large during a period of low solar activity, but small during high solar activity. More than 25-years or two solar cycle has passed since his finding, but the relationship still holds. In order to get an insight into the mechanism of the solar modulation of the El Niño Southern Oscillation (ENSO), here we have revisited this problem.

Solar cycle modulation of the BO in the tropical SST is discernible since the end of the 19th centuries, but the amplitude modulation is particularly clear after 1960's. The composite analysis of the SST based on the amplitude of the BO during 1958-2012, indicates that the amplitude of BO is larger when the equatorial Pacific temperature anomalies are high in the central Pacific, but low in the eastern Pacific. Central Pacific anomalies extend to the northern hemisphere, while those in the central Pacific spread toward the southern hemisphere. In short, this anomalous SST pattern is similar to the El Niño modoki. In this connection, it should be noted that the solar signal in the tropical SST also exhibits a similar pattern. This suggests that the modulation of the ENSO variability by the solar cycle originates through a modulation of the El Niño Modoki rather than the canonical El Niño.