

Ocean Heat Content (OHC) Anomaly during Different Phases of the Solar Cycle in the Tropic Pacific

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Several studies have found that, the quasi-decadal (~11year) solar signal does exit in the Tropic Pacific, but not very significant, its response to the solar periodic radiation forcing is still on debate. So in this paper, first, the solar signal (~11year) is detected in the Tropic Pacific, in which the strongest signal areas are taken as Study Areas for this research. The phase parameter of Total Solar Irradiance (TSI) cycle is defined as a function of TSI values, and then we examine the Tropic Pacific thermal state anomaly during different TSI phases, for example, Ocean Heat Content anomaly (OHCa) and Sea Surface Temperature anomaly (SSTa) in the study areas. At last, we further discuss the variation of OHC anomaly patterns during different TSI phases, and according to the zonal wind anomaly, propose a possible mechanism for the changing.

In this study, we find a strong correlation between TSI and Ocean Heat Content anomaly delayed by 2 years, and a quasi-decadal (~11year) solar signal does exit in the SSTa, OHCa and surface zonal wind anomaly in some regions of the Tropic Pacific with high level statistical significance(>95%). And when TSI cycle is divided into different phases: the Ascending Phase and Declining Phase, during different phases of TSI cycle, the anomaly patterns of OHC, SST and zonal wind are spatial symmetric with a reciprocal positive-negative anomaly characteristic; these features indicate that, during different TSI phases, the variation of solar radiation has a significant effect on ocean thermal state. However, a further analysis demonstrates the locations of OHC anomaly center are also regulated by the air-sea interaction.

Key words: ocean heat content anomaly, total solar irradiance, solar cycle phases, the tropic pacific