

Onset of the Bay of Bengal summer monsoon and the seasonal timing of ENSO' s decay phase

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Based on multiple sources of atmospheric and oceanic data, this study demonstrates a close relationship between the onset of the Bay of Bengal (BOB) summer monsoon (BOBSM) and the seasonal timing of ENSO' s decay phase. Through distinguishing 'later-decay' and 'normal-decay' ENSO events, it is found that a later/earlier onset of the BOBSM following El Niño/La Niña is mainly caused by later-decay ENSO events, while no significant changes in BOBSM onset can be identified between normal-decay El Niño and normal-decay La Niña events. Diagnosis of the related dynamic and thermodynamic processes further confirms that, for later-decay ENSO events that remain active until mid-April, persistent ENSO-induced 'atmospheric-bridge' processes can significantly modulate the lower tropospheric barotropic instability over the northern BOB by inducing a remarkable anomalous zonal SST gradient between the Indian Ocean and the western Pacific. Meanwhile, these processes alter the position of the South Asian high and the upper atmospheric divergence-pumping through the anomalous Walker circulation. A stronger vertical coupling between the upper and lower troposphere, which is crucial for BOBSM onset, thus appears anomalously earlier (later) following a later-decay La Niña (El Niño). In contrast, due to the earlier damping of normal-decay ENSO, the BOBSM onset processes are barely modulated.

Keywords: Bay of Bengal, Summer monsoon onset, Seasonal timing of ENSO's decay phase