



Local Oceanic Precursors for the Summer Monsoon Onset over the Bay of Bengal and the Underlying Processes

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ABSTRACT

Local sea surface temperature (SST) plays an important role in the onset of the Bay of Bengal (BoB) summer monsoon (BoBSM). In the previous study we found that the meridionally warmest SST axis (WSSTA) appears in mid-April in the central BoB, which may be a precursor for the BoBSM onset. Furthermore, we find that a warm but not the meridionally warmest center, which is defined as the secondary WSSTA (SWSSTA), occurs in early April in the central BoB, leading the BoBSM onset by five pentads. Dates of the SWSSTA occurrence are significantly positively correlated with dates of the WSSTA occurrence in the central BoB and the BoBSM onset on an interannual time scale. The SWSSTA is an earlier precursor for the BoBSM onset. The formation of the oceanic precursor and its impact on the BoBSM onset are as follows. Before the BoBSM onset, resulting from more surface heat input and shallower mixed layer affected by the low-level anticyclone and subtropical high in the central BoB, local SST shows the most rapid increase. Meanwhile, the situation is adverse to the rapid increase of SST in the equatorial BoB. For this reason, the SWSSTA occurs, and the WSSTA subsequently appears in the central BoB. The WSSTA in turn enhances local convection, eliminates the low-level anticyclone, and moves the subtropical high outward away from the BoB by inducing atmospheric instability, thus developing a heating center. Convective heating further strengthens southwesterlies in the BoB by exciting mixed planetary-gravity waves, resulting in the BoBSM onset.