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Effect of the early and late onset of summer monsoon over the Bay of Bengal on Asian precipitation in May

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The impact of early and late Bay of Bengal (BoB) summer monsoon (BoBSM) onset on Asian precipitation in May is investigated. When the BoBSM occurs earlier (later), May rainfall tends to be enhanced (suppressed) in the southern Indian peninsula (SIP), the Indochinese peninsula (ICP), southwest China (SWC) and the South China Sea (SCS), while south China (SC) rainfall tends to be suppressed (enhanced). When the BoBSM occurs earlier than the climatological mean (late April), strong convective activity emerges earlier over the BoB, which causes local strong convective heating earlier. Then, earlier spread of heating in the BoB towards both sides leads to earlier retreat of the subtropical highs in the western Pacific (WPSH) and Indian Ocean (IOSH) outwards the BoB. Thus, compared to the climatological mean, the two subtropical highs present larger retreat outwards the BoB and smaller meridional extent over the SCS and Arabian Sea in May, which contributes to positive heating anomalies over the SCS and Arabian Sea. Therefore, anomalous cyclonic circulations occur over the BoB, SCS and Arabian Sea in May. Anomalous cyclonic circulation is favorable for low-level convergence over the SIP, and thus resulting in local heavy rainfall. Associated with cyclonic circulation anomalies over the BoB and SCS, anomalous low-level convergent winds and ascending flows favor positive precipitation anomalies in the ICP, SWC, and SCS, while anomalous northeasterlies and descending flows affected by the southward retreat of the WPSH lessen SC rainfall. In late onset years the opposite occurs.