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Intraseasonal oscillation features of the South China Sea summer monsoon and its response to abnormal MJO in the tropical Indian Ocean

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This paper analyzes Intraseasonal Oscillation (ISO) features and inter-annual differences of the South China Sea (SCS) Summer Monsoon (SCSSM), evolution of its Low Frequency (LF) circulation and convection fields and precipitation anomalies, and path of ISO propagation, as well as impact of MJO in tropical Indian Ocean on SCSSM ISO during 1979–2008. It is found that (1) The SCSSM ISO goes through six phases (exclusive of the weak phase) at every complete fluctuation: developing, strongest, weakening, restraining, weakest and recovering phase. Due to tropical LF convection propagating eastward and northward, the LF convection and circulation in the 1st–3rd and 4th–6th phases present the anti-phase in the Arabian Sea-West Pacific zonal band. Its corresponding rainy bands also present anti-phase roughly. The rainy band moves eastward with LF convection mainly in tropical regions in the south of 20˚N, while moves northward in East Asia subtropical regions in the north of 20˚N. (2) The SCSSM ISO intensity presents significant inter-annual difference. There are three stronger ISO in the stronger SCSSM ISO years. The first two oscillations propagates from the tropical Indian Ocean to the Bay of Bengal firstly, and then to SCS along the 10˚–20˚N zonal direction, stimulates the ISO to propagate to South China, forming a relay propagation path in meridional-zonal direction. Moreover, in the weaker SCSSM ISO years, the ISO weakens greatly and irregularly. In averaged conditions, the ISO propagates from tropical Indian Ocean to the SCS by about 20 days (one half ISO periods). (3) MJO1 (the first modal of MJO index provided by the Climate Prediction Center) averaged value in the 1st–2nd pentads of April has the negative correlation with the SCSSM ISO intensity. When MJO in tropical Indian Ocean is more active in the 1st–2nd pentads of April, it is stronger in the subsequent May to August, and the ISO also propagates strongly to the SCS, so that the SCSSM ISO strengthens. Conversely, the SCSSM ISO weakens. The abnormal MJO in the 1st–2nd pentads of April contributes to a certain theory basis to predict the subsequent SCSSM ISO intensity and analyze the abnormal rainfall in related regions.