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Low-frequency Intensity Variation of the South Asian High and its relationship to Boreal Summer Intraseasonal Oscillation

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The South Asian High (SAH) is an important member among the Asian summer monsoon circulations in the upper troposphere located over the Tibean Plateau and its surrounding areas during boreal summer. This research attempts to study the characteristics and mechanisms of low-frequency oscillation of SAH, using daily ERA-Interim reanalysis dataset and NECP/NCAR OLR data. The empirical orthogonal function (EOF)analysis is performed on 200hPa geopotential height low-frequency anomalies over the 20°-35°N, 35°-110°E for June, July and August from 1979 to 2013. The first EOF mode shows a monopole pattern capturing the strengthening or weakening of the SAH's body. The power spectrum analysis of the corresponding principal component (PC1) time series shows that the first mode has a period about 10-30 days. Positive anomalies appear in the 200hPa geopotential height and negative anomalies appear in their north side when SAH is in positive low-frequency phase. A band with negative outgoing longwave radiation (OLR) anomalies presents from the Arabian Sea, north of Indian Peninsula to Southeast China and Japan Island. Correspondingly, positive anomalous rainfall are contiguous in the north of Indian Peninsula, south of Tibetan Plateau, Southeast China and Japan Island. The lead-lag regression analysis demonstrates that from day -12 to day 0, negative OLR anomalies band move northward and northwest from the equatorial Indian Ocean, the Bay of Bengals, the South China sea and Western North Pacific to the Arabian Sea, north of Indian Peninsula, south of Tibetan Plateau, Southeast China and Japan Island. Corresponding to OLR anomalies, positive rainfall anomalies band have the similar evolution. The spatial pattern of anomalies in integrated apparent heat source <Q1> and integrated apparent moisture sink <Q2> resemble that of rainfall and OLR, which correspond more anomalous condensation heat release. The lead-lag regression analysis also shows that the OLR band moving northward and northwest from day -12 to day 0 is associated with the Boreal Summer Intraseasonal Oscillation 2 (BSISO 2) of 10—30 days in the Asian monsoon areas. When $BSISO_2$ propagates from subtropics to Asian continents , more anomalous rainfall appear in the Asian monsoon areas, which correspond more anomalous condensation heat release. The anomalous heating stimulate positive height anomalies with an anomalous anticyclonic circulation to its northwest in the upper troposphere, causing the strengthening of the SAH intensity. In addition, the strengthening of the west part of SAH may result from an anomalous low-frequency anticyclonic in the upper troposphere propagating northward from Arabian Sea to Iranian plateau.