



Dynamics of the Asian Summer Monsoon Onset and the Tibetan Plateau Impacts

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The formation and development of the South Asian High (SAH) in early spring over South China Sea (SCS) provides upper tropospheric pumping over the Southeast Bay of Bengal (BOB) and leads to the BOB monsoon onset. The strong latent heat release of the BOB monsoon results in the northeastward unstable development of the SAH which contributes to the SCS monsoon onset. The zonal asymmetric unstable development of the SAH after the SCS monsoon onset leads to the Indian summer monsoon onset. In spring over South BOB, usually there is vortex development preceding the Asian summer monsoon onset. The rapid development of the BOB monsoon onset vortex is due to the local strong air-sea interaction, which is modulated by the Tibetan Plateau (TP) forcing and the land-sea thermal contrast across South Asia. Strong heating from BOB monsoon generates stationary Rossby-wave in lower troposphere, producing weak cold advection and convection over North SCS. Development of surface BOB cyclone provides Northeastward water vapor transport towards North SCS where convection develops. Before the Indian Summer Monsoon (ISM) onset, the North-South land-sea thermal contrast increases eastward remarkably on the southeast of Arabian Sea. Air traveling eastward along the near-surface tropical westerly jet gets northward accelerated, forcing a lower tropospheric convergence near and to the north of the jet stream. Such a forced convection development occurs intensively over the southeastern Arabian Sea and southwestern India, contributing to the ISM onset.