

# **Barrier of the Asian Summer Monsoon Onset**

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The onset process of Asian summer monsoon (ASM) is investigated based on diagnostic analysis of observations of precipitation and synoptic circulation. Results show that after the ASM commences over the eastern Bay of Bengal (BOB) around early May, the onset can propagate eastwards towards the South China Sea and western Pacific but is blocked on its westward propagation along the eastern coast of India. This blocking, termed the “monsoon onset barrier (MOB)”, presents a Gill-type circulation response to the latent heating released by BOB monsoon convection. This convective condensation heating generates summertime (wintertime) vertical easterly (westerly) shear to its east (west) and facilitates air ascent (descent). The convection then propagates eastward but gets trapped on its westward path. To the east of the central BOB, the surface air temperature (SAT) cools faster than the underlying sea surface temperature (SST) due to monsoon onset. Thus more sensible heat flux supports the onset convection to propagate eastward. To the west of the central BOB, however, the land surface sensible heating over the Indian Peninsula is strengthened by the enhanced anticyclone circulation and air descent induced by the BOB monsoon heating. The strengthened upstream warm horizontal advection then produces a warm SAT center over the MOB region, which together with the in situ cooled SST reduces the surface sensible heating and atmospheric available potential energy to prevent the occurrence of free convection. Therefore, it is the change in both large-scale circulation and air–sea interaction due to BOB summer monsoon onset that contributes to the MOB formation.

**Key words:** monsoon onset barrier; Bay of Bengal summer monsoon; Gill-type response; air–sea interaction

## **References**

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