



Equatorward shift of the South Asian high in response to anthropogenic forcing

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The South Asian High (SAH) is a huge anticyclone in the upper troposphere. It influences the climate and the distribution of trace constituents and pollutants. The present study documents the change in the SAH and precipitation under global warming, as well as the possible link between the changes, based on 17 Coupled Model Intercomparison Project Phase 5 (CMIP5) model simulations. The CMIP5 historical simulation reproduces reasonably the tropospheric circulation (including the SAH), precipitation and moisture.

Under global warming, more than 75% of the CMIP5 models project a southward shift of the SAH. The southward shift is more significant in the models with stronger anticyclonic circulation in south part of the climatological SAH. The precipitation response displays a contrasting feature: negative over the southeastern equatorial Indian Ocean (IO) and positive over the tropical northern IO, the Bay of Bengal and the equatorial western Pacific. The results of a linear baroclinic model (LBM) show that the regional rainfall changes over the Bay of Bengal and the equatorial western Pacific have a main contribution to the southward shift of the SAH.

In addition, the precipitation and the surface wind responses over the Indo-Pacific region are well coupled. On one hand, the surface wind anomaly affects the rainfall response through altering the SST and moisture. On the other hand, the condensational heating released by regional rainfall changes sustains the surface wind response.