



Shutting off the monsoon: attribution of the monsoon anticyclone

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In boreal summer, the climatological upper-level flow in the eastern hemisphere is dominated by an anticyclone that extends over more than 140 degrees of longitude. Here we analyze how much the Asian monsoon contributes to this anticyclone, by removing the monsoon-related convective heating from a general circulation model. The ICTP SPEEDY model is used with 8 vertical levels and T30 horizontal resolution, which reproduces a realistic tropospheric circulation.

Shutting off the primary area of Asian Monsoon convective heating in this model (5-20N, 90-120E) only reduces the strength of the upper level anticyclone by about 30% and does not materially affect its extent. However, the changes to circulation do exhibit three distinct maxima spanning more than 80 degrees of latitude, and extending into the Southern Hemisphere subtropics. There is also a small area of monsoon convection to the north of 20N; zeroing out this heating as well has a very disproportionate effect, nearly doubling the circulation change. Nonetheless, even with all Asian Monsoon heating removed, the upper level cyclone persists over much of its original domain, with a decrease in strength of only slightly more than 50%. Therefore, the monsoon anticyclone plays an important but not determinant role in the overall anticyclone. A two-layer shallow water model is used to examine the dynamics of the interaction of different areas of the monsoon heating with the mean flow. We are in the process of repeating these experiments in the NCAR Community Atmosphere Model.