



The response of the East Asia summer precipitation to greenhouse gases and anthropogenic aerosols

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The changes of precipitation over China since the mid-20th century display a dipole trend pattern over eastern China, which is known as Southern-Flood-Northern-Drought (SFND) pattern. The trends have been attributed to different factors, such as the changes of aerosol and greenhouse gas emissions. However much less is known about the different effects of these factors on generating the SFND pattern. This work investigated the drivers and dynamical mechanisms by using a atmosphere-ocean-mixed-layer model forced by anthropogenic greenhouse gase (GHG), anthropogenic aerosol (AA) and the combined effects.

The model experiments with different forcings indicates that the GHG forcing dominates the precipitation increase, which is stronger over south China than over north China. On the other hand, the drought over north China is dominated by the AA forcing. Analysis of physical processes indicates that the GHG forcing increases the moisture and leads to strong convergence over east China, and then more precipitation. The AA forcing leads to north wind anomalies and generates divergent anomalies over north China, which reduces the precipitation. Further analysis indicates that the changes of the circulation which related to the SFND pattern are forced by the enhancement of the Western North Pacific Subtropical High (WNPSH). Both GHG and AA forcing can enhance the WNPSH by changing the local Hadley cell.