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Impact of Sea Surface Temperature Trend on Late Summer Asian Rainfall in the 20th century

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The impact of the global sea surface temperature (SST) warming trend, which is the leading mode of SST variability, on late summer Asian rainfall is analyzed based on the simulations of five atmospheric general circulation models (AGCMs), which are performed by the U. S. Climate Variability and Predictability (CLIVAR) Drought Working Group. Our evaluations of the model outputs indicate that these models roughly capture the main features of climatological rainfall and circulations over Asia and the western North Pacific (WNP), but they simulate a too strong monsoon trough and a too northward shifted in the subtropical anticyclone in the WNP, and fail to reproduce the rainy belt over East Asia.

It is found that all of the models simulate an intensified WNP subtropical high (WNPSH) in late summer, and an enhanced precipitation in the tropical Indian Ocean and the maritime continent, and a suppressed precipitation in the tropical WNP, when the models are forced with the SST trend, which is characterized by a significant increase in the Indian Ocean and western Pacific. All these changes are suggested to be dynamically coherent. In addition, precipitation changes forced by the SST trend are similar in the tropics, but show an apparent difference over extratropical Asia, in comparison with the observed rainfall trend. The possible reasons for this similarity and difference are discussed.