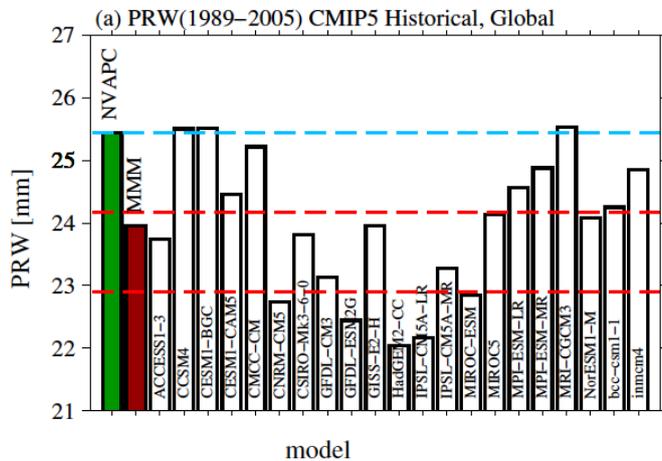
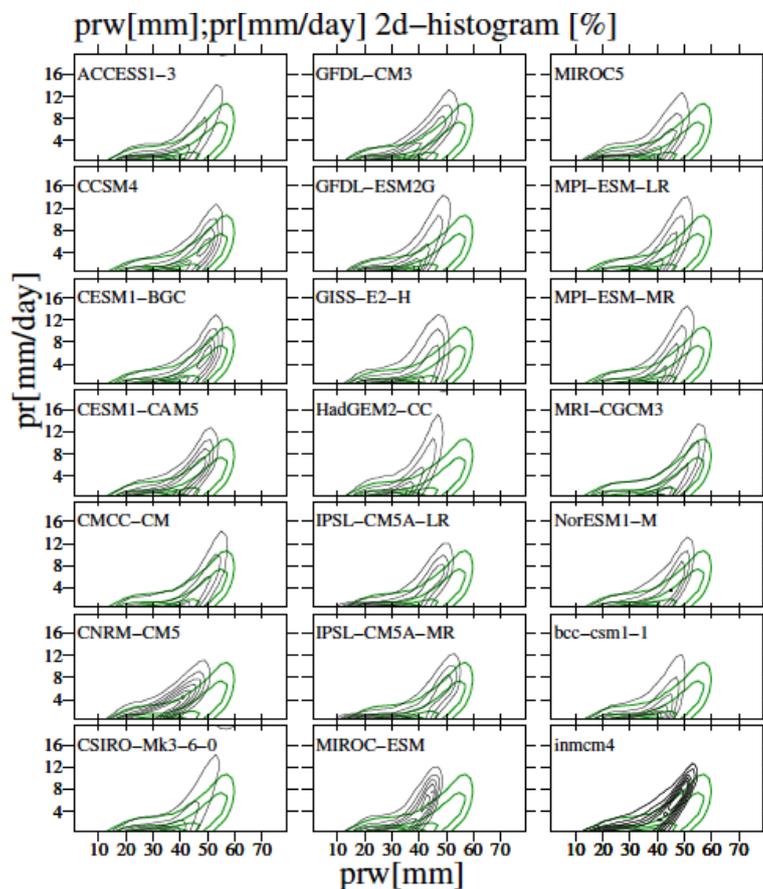


Takahashi, H. G., 2018: A systematic tropospheric dry bias in the tropics in CMIP5 models: Relationship between water vapor and rainfall characteristics. *J. Meteor. Soc. Japan*, **96**, 415-423. <https://doi.org/10.2151/jmsj.2018-046>



←Fig. 1: Global mean precipitable water (PW) amounts of the observations and simulations. Multi-model mean (MMM) indicates a 21 model-ensemble mean. The light-blue dashed line indicates the NVAP-M Climate (NVAP-C) observations. The upper (lower) red dashed lines indicate -5% (-10%) of the NVAP-C observations.



←Fig. 6. Two-dimensional histogram between PW and precipitation over the tropics (30°S—30°N). The class width of PW is 2 mm from 0 to 80 mm. The class width of precipitation is 1 mm day⁻¹ from 0 to 20 mm day⁻¹. The green contours in each panel show the histogram between the observed PW and observed precipitation. The black contours in each panel show the histogram between the simulated PW and simulated precipitation. The name of the specific CMIP5 model is shown in each panel. In all panels, the occurrence frequency was calculated from monthly mean values over 204 months (17 years) on 2.5 2.5 grids over the tropics. The contour intervals are 0.2%, from 0.2% to 1.4%. The smallest value of the contours is 0.2%. The values are shown as percentages.

- This study investigated the absolute values of column-integrated water vapor (precipitable water; PW) in the CMIP5 climate models. We identified that global mean PW values are systematically much lower in CMIP5 models than in observations. This dry bias is most profound over the tropical ocean.
- The dry bias is partly due to biases in sea surface temperatures in the CMIP5-coupled climate models. However, the dry bias is also present in AMIP, which implies the existence of other factors.
- The relationship between PW and rainfall characteristics shows that rainfall occurs when water vapor levels are lower than in observations, particularly in models with a relatively strong dry bias, suggesting that the reproducibility of rainfall characteristics may be associated with the dry bias.