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A discrepancy in precipitable water among the major reanalyses over tropics and its effect on downscaling

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We compared precipitable water (PW) among four major reanalyses, namely NCEP/NCAR, NCEP/DOE, ERA40, and ERA-Interim reanalyses, and investigated the effect of the reanalyses on downscaling in the tropics, using a regional climate model.

Spatial peaks of PW in July were found over the Bay of Bengal, South China Sea, and the western North Pacific in reanalyses, which indicates that the spatial pattern of PW in the reanalyses closely agreed with observations. However, the absolute amounts of PW in some reanalyses were very small over the entire Asian monsoon region. Note that the discrepancy in the 12-year mean PW in July over the Southeast Asian monsoon region exceeded the interannual standard deviation of the PW. A discrepancy in PW was also found over the entire tropics throughout the year, which indicates that this is not a regional problem, but rather a global one.

We conducted downscaling experiments driving by the reanalyses. The simulated rainfall over the domain driving by ERAint, which analyses rearistic PW, was good agreement with observation. However, the simualted rainfalls downscaled from NCEP/NCAR and NCEP/DOE were significantly underestimated. Although the dry bias in the driving data was only 6 %, the simulated precipitation was six-tenths, which indicates that the effect of downscaling is extremely large, particularly on precipitation.

A future study will investigate the differences in PW in global climate models.