



Long-term trends and interannual variability of water vapor over the tropics in reanalyses, CMIP5 models and observations

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The strength of the hydrological cycle in the atmosphere and its long-term changes are of considerable interest, especially as the climate changes. The hydrological cycle in the atmosphere is summarized as evaporation of moisture from the earth surface (land and ocean) and precipitation into the earth surface. The global warming can modulate the strength of hydrological cycle. Many previous studies have investigated the long-term changes in precipitation. However, the investigation of the long-term changes in water vapor has been limited. We investigated the changes and interannual variability in water vapor in the atmosphere of the global scale using multiple reanalyses, CMIP5 models and observations.

In reanalyses, the long-term changes in surface air temperature and PW over the tropical ocean were out of range of some observations. Both long-term changes in surface air temperature and PW may have problems. There may be no common systematic bias. The observation shows PW over ocean probably increases for recent two decades. However, the trend in PW was reduced. The reduction of the trend is associated with the hiatus of global warming after 2000's. The relationship between surface air temperature and PW was not fitted to CC relationship on the long-term trend. The long-term changes in surface air temperature and PW in the CMIP5 models are basically fitted to the CC relationship (Global mean values of water vapor were approximately 6.5-7.5% per K).