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# Variability of global atmospheric water vapor and heat budgets in remote-sensing and reanalysis data

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Atmospheric water and energy cycles are the fundamental and key components to the mechanics and impacts of climate change. Remote sensing instruments onboard present-day satellite platforms have measured various components of the Earth's hydrological and energy cycle. Retrieval and analysis products are now available for studies of the global hydrological and energy budgets (e.g., NASA A-Train and TRMM). However, no investigation to date has quantified whether these datasets from different measurements and estimations are physically consistent with each other with regard to describing the variability of global hydrological and thermodynamic processes. We investigate if the remote-sensing retrieval products corresponding to different components of the atmospheric branch of hydrological and energy cycles are physically consistent with each other, and if they can coherently describe variability of these cycles on different time scales. Measurements of atmospheric temperature and specific humidity profiles from AIRS together with NASA MERRA's wind fields will be employed for detailed and comprehensive calculations of apparent water vapor sink and heat source in the atmosphere. Then, the atmospheric water vapor sink will be compared with satellite or observation-based precipitation and surface evaporation estimates (e.g., TRMM3B42, GPCP, GSSTF2b, OAFlux, etc.). The atmospheric heat source will be compared with available independent estimates of diabatic heating rates (e.g., TRAINQ1). Variability of climate variables related to the water vapor and heat budgets is assessed for regions of heavy precipitation in the tropics.