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Interannual Variation of Global Precipitation

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It was suggested that the intensity of the global hydrological cycle undergoes an interannual variation in accord with the ENSO cycle: intensified (weakened) during the warm (cold) ENSO event (Chahine 1997). This suggestion was demonstrated by numerical simulations using numerous global climate models [including two groups: 1) US climate models: NMC3, CAM2, CCM3, NSIPP, COLA, and 2) DEMETER models: ECMWF, UK Met Office, LODYC, Météo-France, CERFACS, Max Planck Institute, HIRLAM, INGV]. As revealed from its global distribution, heavy precipitation is located over the Asian-Australia (AA) monsoon hemisphere ($10^oE\sim170^oW$). The ratio of precipitation between the AA and the extra-AA (EA) monsoon hemisphere ($170^oW\sim10^oE$) is 1.04. The interannual variation of the global precipitation is coupled with the eastward propagation of the ENSO mode in the following manner: precipitation decreases over the AA monsoon hemisphere and increases over the extra-AA monsoon hemisphere during the warm ENSO event, and the reverse occurs during the cold ENSO event. The global precipitation compiled/observed by CMAP, GPCP, TRMM and GPI exhibits a large ratio (1.22) of precipitation between the AA and the EA monsoon hemisphere and an interannual variation *opposite* to the model simula-

tion. The contrast is attributed to the fact that the global precipitation is dominated by the AA monsoon hemisphere. The simulation of the interannual seesaw variation of precipitation between the two hemispheres coupled with the eastward propagation of the ENSO mode matches well with observations. The interannual variation in the model global precipitation opposite to observation is caused by insufficient precipitation generated by models over the AA monsoon hemisphere. In order to remedy this common model problem, the cumulus parameterization in the tropical region should be improved to enlarge the rainfall contrast between the two hemispheres.