

Precipitation characteristics of ISCCP cloud regimes for improving GCM water cycles

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The key in unraveling relationships between precipitation and atmospheric circulations is their common linkage to clouds. Clouds can be described in a variety of ways and several approaches can be adopted to examine their connections to precipitation. We claim that when cloud regimes (aka weather states) from the International Satellite Cloud Climatology Project (ISCCP) are used to conditionally sample/sort and average precipitation data, useful insight and GCM-appropriate diagnostics on the origins and distribution of precipitation can be obtained. The ISCCP cloud regimes are mesoscale (2.5o) cloud mixtures determined by cluster analysis of joint histograms of cloud optical thickness and cloud top pressure inferred from geostationary and polar orbiter satellite passive retrievals. The ISCCP cloud regime data are combined with GPCP 1DD merged surface precipitation data and/or higher temporal and spatial resolution TRMM Multi-Satellite Precipitation Analysis (TMPA) data. The analysis is performed separately for three geographical zones, tropics, and northern/southern midlatitudes (for GPCP; only the tropics can be examined with TMPA data). Our presentation intends to answer the following questions: (1) What is the mean and variability of surface precipitation produced by each cloud regime at the time of regime occurrence? (2) What is the relative contribution of each cloud regime to the total precipitation within its geographical zone? (3) What is the geographical distribution of precipitation corresponding to particular cloud regime? (4) To what extent are the cloud regimes distinct in terms of their precipitation characteristics and is the regime classification in terms of convective strength consistent with the observed precipitation intensity?