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Assessment for the cloud overlapping assumptions and their longwave radiative effects estimated by NASA/GEWEX Surface Radiative Budget (SRB) and the CALIPSO-CloudSat-CERES-MODIS (C3M) data sets.

Antonio Viudez-Mora, Paul W. Stackhouse Jr, and Seiji Kato

NASA Langley Research Center, Climate Science Branch, Science Mission Directorate, Hampton, United States (toni.v.mora@nasa.gov)

Clouds play an important role in understanding the global energy budget and in its role in determining climate variability present and future. In order to produce accurate estimates for the radiative fluxes, one of the main requirements is to describe as much realistic as possible the spatial and temporal distributions of clouds. To date, the satellite-based measurements help us to quantify the cloud coverage globally and therefore retrieve their properties and the consequent radiative effects. Considering the different characteristics of the instruments (passive or active) aboard the EOS (Earth Observation System) and also their temporal and spatial coverage, the cloud vertical structure can be estimated with different accuracy. Partial cloudiness is frequently observed to occur in multiple vertical layers and the assumptions considered into the radiative transfer models determine the accuracy of the estimates for the radiative fluxes.

This study shows a global assessment of retrieved cloud properties, cloud overlapping assumptions and their radiative effects on the longwave fluxes by two different datasets: the NASA/GEWEX Surface Radiation Budget, in its release 3.1, and the CALIPSO-CloudSat-CERES-MODIS, thereafter C3M, this one in its release B1. The period of time used in this study correspond during the whole overlapping year of 2007. The results of this study quantify the agreement between both projects on different spatial and temporal scales showing mean monthly differences. The study also looks for the origin of these differences between SRB and C3M longwave fluxes due to the cloud overlapping assumptions made in SRB. The different cloud properties (cloud fraction, cloud top and bottom pressure and cloud optical depth) are shown to determine the differences on the longwave radiative fluxes.