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Radiative Fluxes and Cloud Radiative Effect using CM SAF CLARA-A2 global cloud cover and comparison with ISCCP

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Clouds are crucial for the Earth's global climate, since they reflect shortwave (SW) radiation back to space and prevent the emission of longwave (LW) radiation to space. However, clouds remain one of the most substantial uncertainties in assessments of climate change. Therefore, studying cloud radiative effects (CRE) and their associated trends is vital for better understanding the global climate. To this aim, cloud datasets derived from satellite observations, which provide long-term and uniform global records, are of great importance and necessary for climate studies. In this framework, it is very important to assess and inter-compare different cloud datasets, especially those having global coverage. In such assessments, the role of cloud cover is predominant and being given special attention.

We present here the SW radiative fluxes and CREs for the period 2000 - 2009 computed on a global scale using a detailed spectral radiative transfer model (RTM) and satellite input data from two major global cloud datasets. The model takes into account the physical parameters that drive solar radiation transfer in the Earth-atmosphere system, through scattering and absorption, namely clouds, aerosols, water vapor and other trace gases. The model results are computed at $2.5° \times 2.5°$ latitude-longitude spatial resolution and on a monthly basis. The study is performed using two different well-known global cloud datasets. First, CREs are computed using cloud properties from the International Satellite Cloud Climatology Project ISCCP-D2, whilst in the second case the study is repeated using cloud cover (CC) from the AVHRR-based CM SAF CLARA-A2 dataset. In both cases, MODIS (Moderate Resolution Imaging Spectroradiometer) aerosol properties are used, namely aerosol optical thickness (AOT), single scattering albedo (SSA) and asymmetry parameter (AP), while input data for other surface and atmospheric parameters are supplemented either by ISCCP-D2 or by NCEP Reanalysis. The CREs are calculated separately for low-, mid- and high-level clouds as well as for all clouds from the difference of model SW fluxes obtained from RTM runs considering or not the presence of clouds (all- and clear-sky fluxes). The study focuses on the comparison and differences between the spatial and temporal patterns of ISCCP-D2- and CLARA-A2-based CREs.