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A 34 Year Assessment of Surface and Top-of-Atmosphere Radiative Fluxes from the NASA's GEWEX Surface Radiation Budget Release 4 Integrated Product

Paul Stackhouse[1], Stephen Cox[2], J. Colleen Mikovitz[2], and Taiping Zhang[2]
[1]NASA Langley Research Center, Atmospheric Science/Climate Sciences Branch, Hampton, VA, United States of America (paul.w.stackhouse@nasa.gov)
[2]Science Systems and Applications, Inc., Hampton, VA

The NASA/GEWEX Surface Radiation Budget (SRB) project is finalizing a 3-hourly shortwave and longwave surface and top-of-atmosphere radiative fluxes for a 34-year period from July 1983 through June 2017. The new Release 4 Integrated Product (IP) uses the newly recalibrated and processed ISCCP HXS product as its primary input for cloud and radiance data, replacing ISCCP DX with a ninefold increase in pixel count (10 km instead of 30 km). This first version retains a 1°x1° resolution for intercomparison against previous versions and other data sets such as CERES. ISCCP also provides an atmospheric temperature and moisture dataset known as nnHIRS which we use and discuss radiative flux sensitivities to in this presentation. In addition to the input data improvements, several important algorithm improvements have been made since Release 3. These include recalculated SW atmospheric transmissivities and reflectivities yielding a somewhat less transmissive atmosphere. Ocean albedo and snow/ice albedo are also improved from Release 3. Total solar irradiance is now variable consistent with SORCE measurements. The LW code has been updated to improve the optical property treatment for clouds, particularly ice clouds, and aerosols are included in this version. The variable aerosol composition are specified using a detailed aerosol history from the Max Planck Institute Aerosol Climatology (MAC). Seasonally dependent spectral surface emissivity maps are now also included. In this presentation, we analyze the new SW and LW SRB datasets, comparing them to the previous Release 3, BSRN, GEBA and PMEL surface measurements, and ERBE and CERES satellite datasets. For surface flux validation besides ensemble comparisons, we show the variability of SRB vs surface measurements from BSRN beginning in 1992 and GEBA from 1983. For the early period, comparison of top-of-atmosphere flux variability is made to latest version of ERBE fluxes. For the latter period, we provide comparisons to CERES SYN1Deg and EBAF datasets for a benchmark. Long-term changes in the surface radiation budget components and cloud radiative effects are shown and discussed relative to CERES and surface measurements. An assessment of long-term changes are made including an assessment of uncertainties due to satellite artifacts.