Title: Development of a Radiation Climate Data Record Combining ERBE and AVHRR

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A recent analysis of radiation measurements at the top of the atmosphere (TOA) indicates that the Earth's radiation budget over the tropics has changed between the 1980s to the 1990s; outgoing longwave irradiance increased by 1.6 W m-2 and reflected shortwave irradiance decreased by 3.0 W m-2. Because TOA radiation budget variability is highly correlated with cloud cover variability, the results suggest that a significant change in the cloud cover occurred between 1980s to the 1990s. In addition, recent analyses indicate that downwelling shortwave radiation at the surface decreased in the 1980s, but the trend was reversed in the 1990s. We propose to use data from the Earth Radiation Budget Experiment (ERBE) and Advanced Very High Resolution Radiometer (AVHRR) on NOAA 9 and 10 to produce the same suite of advanced cloud-radiation data products currently being produced by the CERES program using data from CERES and MODIS on the Terra and Aqua platforms (and eventually CERES and VIIRS on NPP and NPOESS). The ERBE scanners on NOAA 9 measured broadband shortwave, longwave and total radiances from February 1985 to January 1987, and the ERBE scanner on NOAA 10 measured from January 1987 to May 1989. The objective is to extend the mature long-term CERES climate data records back in time so that cloud-radiation changes from the 1980s onwards can be studied in an accurate and consistent manner. Merging ERBE and AVHRR data enables the retrieval of cloud and aerosol properties over ERBE scanner footprints and improved TOA radiative fluxes from new, more advanced angular distribution models built from CERES radiances from the TRMM, Terra, and Aqua satellites. To ensure consistency between the ERBE and CERES scanner periods, a high level of relative accuracy can be achieved by using overlapping Earth Radiation Budget Satellite (ERBS) nonscanner active cavity radiometer measurements as a transfer standard between the NOAA 9 and 10 ERBE scanner data and the CERES scanners on TRMM, Terra and Aqua. The new dataset will enable irradiance changes to be examined by cloud type and region and provide net radiation at top-of atmosphere and surface. In addition, it will offer an independent source of the TOA and surface radiation budget data that can be directly compared with International Satellite Cloud Climatology Project (ISCCP) data, which cover both ERBE and CERES periods.