

# An Alternative Inter-satellite Calibration of the UMD HIRS OLR Retrievals

Franklin R. Robertson  
*Earth Science Office*  
*NASA / Marshall Space flight Center*

and

Hai-Tien Lee  
*Cooperative Institute for Climate Studies/Earth System Science Interdisciplinary Center,*  
*University of Maryland*

Outgoing Longwave Radiation (OLR) at the top-of-atmosphere (TOA) is a fundamental component of Earth's energy balance and represents the heat energy in the thermal bands rejected to space by the planet. Determination of OLR from satellites has a long and storied history, but the observational record remains largely fragmented with gaps in satellite measurements over the past three decades. Perhaps the most semi-continuous set of retrievals comes from the University of Maryland (UMD) algorithm that uses four HIRS (High Resolution Infrared Sounder) channels on the NOAA polar orbiting satellites to *estimate* OLR. This data set shows great promise in helping to bridge the discontinuous ERBS (Earth Radiation Budget Satellite) and CERES (Clouds and the Earth's Radiant Energy System) *measurements*. However, significant satellite inter-calibration biases persist with the present UMD data, principally outside the tropics. Difficulties relate to the combination of drift of the satellite equator crossing time through the diurnal cycle and changes in HIRS channel response function design. Here we show how an ad hoc recalibration of the UMD retrievals among the different satellites removes much of the remaining uncertainty due to diurnal "drift" of the satellite orbit. The adjusted HIRS data (using no other external information) show much better agreement with OLR from the European Center Interim Reanalysis (EC-Int), longer-term signals in the Global Energy and Water Cycle Experiment / Surface Radiation Budget (GEWEX/SRB) retrievals, and also agree well with ERBS and CERES OLR measurements. These results augur well for narrowing the uncertainties in multi-decadal estimates of this important climate variable.