



Daily OLR Climate Data Record – A Challenge to Homogenize Operational Satellite Observations for Climate Applications

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A data set of daily mean outgoing longwave radiation (OLR) at $1^\circ \times 1^\circ$ grid spanning from 1979 to 2012 was generated using infrared radiance observations from the High resolution Infrared Radiation Sounder (HIRS) and Imaging instruments onboard the international operational polar-orbiting and geostationary satellites. The instantaneous OLR can be accurately estimated by the multi-spectral regression model using narrow band radiance observations (Ellingson et al., 1989), however, there are challenges for constructing a climate data record that is homogeneous in both space and time, while maintaining radiometric accuracy. The synergy of polar-orbiting and geostationary observation systems provides advantages that much improve the homogeneity of the temporal and spatial sampling. Bias correction methodologies have been devised to maintain the radiometric accuracy. The HIRS OLR algorithm is revised to handle the problems caused by the configuration variations in the HIRS instruments over time. This removes scene-dependent inter-satellite biases. Incorporating OLR estimated from Imager instruments onboard geostationary satellites not only sufficiently resolves the diurnal variation that is critical for daily integral purpose, but it also helps to remove the artificial trends resulted from the polar-orbiter's orbital drift effects. This work produced a continuous daily OLR climate data record of more than three decades that can be very useful for climate variation and numerical model simulation assessment purposes.