Constraints on the Interannual Variation of Global and Regional TOA Radiation Budgets Inferred from MISR Measurements

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Time series of deseasonalized 10-day and annual anomalies related to the TOA radiation budget are analyzed from MISR measurements, from early 2000 to the present. This data set is unique in consistently applying a geometric-based (stereo) technique to retrieve effective cloud-top height and cloud fraction for different cloud-top heights, to obtain anomalies of these variables that are insensitive to the uncertainty in relative radiometric calibration. In addition, the MISR time series is analyzed for anomalies in albedo, and these are sensitive to radiometric uncertainty. Typically, more than 100 independent Terra orbits contribute to each 10-day value, so that the sampling error can be assessed. On a global, annual basis, the sampling error is about 10 m in effective cloud height, about 0.001 in total cloud fraction, and about 0.0005 in spectral albedo.

The biggest interannual global anomalies observed by MISR that affect the top of atmosphere radiative budget appear to be those in the effective cloud height. These show interesting decreases through 2005, averaging about m/yr. On a regional basis, the largest signal occurs systematically in the InterTropical Convergence Zone, associated with a reduction in high cloud fraction. The 2006 data appear, however, to be showing an increase in height.

In addition to providing an update of the latest anomalies observed by MISR, the implications of these to the net top of atmosphere anomalies will be explored, with emphasis on the constraints implied by the cloud fraction, spectral albedo, and effective height variations.