Spectral Solar Irradiance Requirements for Earth Observing Sensors Operating in the Ultraviolet to Shortwave Infrared

James Butler *[james.j.butler@nasa.gov], NASA Goddard Space Flight Center (GSFC), Greenbelt, MD, USA*

The spectral solar irradiance measurement requirements of Earth observing instruments are driven by the required target uncertainties of their derived science products. In the ultraviolet to shortwave infrared region (i.e. 230nm to 2500nm), science product uncertainties define the fundamental radiance or reflectance measurement requirements of the instruments and are influenced by the target accuracies of the geophysical processes to be measured and their specific applications (i.e. from process to climate studies). For many Earth remote sensing instruments, such as MODIS, VIIRS, OMPS, et al, operating in the reflected solar wavelength region, on-orbit calibration is performed in a reflectance mode, employing on-board targets with known bidirectional scatter distribution functions or well-characterized Earth targets. Generation of radiance products from these instruments requires knowledge of the spectral solar irradiance over each of the instrument bands producing typical radiance uncertainties of 3 to 5% (k=1). Climate applications (e.g., CLARREO and TRUTHS) impose approximately a 10X more stringent requirement on the uncertainties of instrument measurement of reflectance and radiance and, by inference, requirements on spectral solar irradiance. Intercomparisons of radiance measurements produced by international satellite instruments and the production of long time series data sets require the adoption of an SI-traceable, solar irradiance spectrum with lowest uncertainty. For the latter, this is particularly critical in the event of loss of overlap of on-orbit satellite measurements. This presentation will examine spectral solar irradiance measurement requirements with respect to a number of Earth remote sensing applications and scenarios and will discuss the importance of SI-traceability. The presentation will conclude with a brief summary and perspective on the spectral solar irradiance panel review held on September 17 and 18, 2014 at LASP.