Requirements for a Reference Solar Spectrum for Lunar Calibration Applications

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Creating global climate records from space-based Earth observations requires inter-consistency and stability of the satellite sensors' calibrations. The Moon is an ultra-stable diffuse reflector of sunlight that can be used to quantify sensor response changes over time with very high precision and to realize sensor inter-calibrations at reflected solar wavelengths. The fundamental property of the Moon that enables its use as a radiometric reference is the invariant nature of the lunar surface reflectance. Thus, the solar spectral irradiance is a key component of the lunar calibration reference, which constrains its absolute accuracy and defines the spectral content. Recent advances in absolute SSI measurements have opened the possibility of achieving SI-traceable lunar radiometry; however, the lunar calibration application requires higher spectral resolution than these instruments provide. A reference solar spectrum is needed that is scaled to high-accuracy SSI measurements and also retains sufficient solar spectral structure to be used with remote sensing spectrometer instruments. Efforts by the USGS lunar calibration project toward constructing such a reference spectrum have found some additional needs regarding the constituent solar data, which potentially could drive specifications for future SSI measurements.