
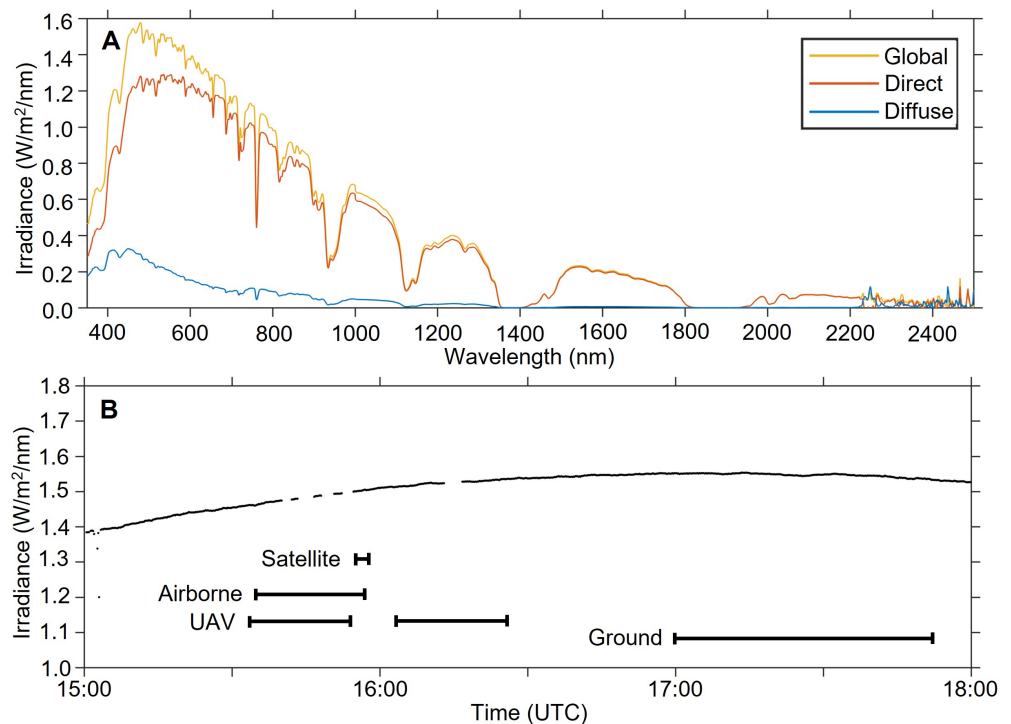


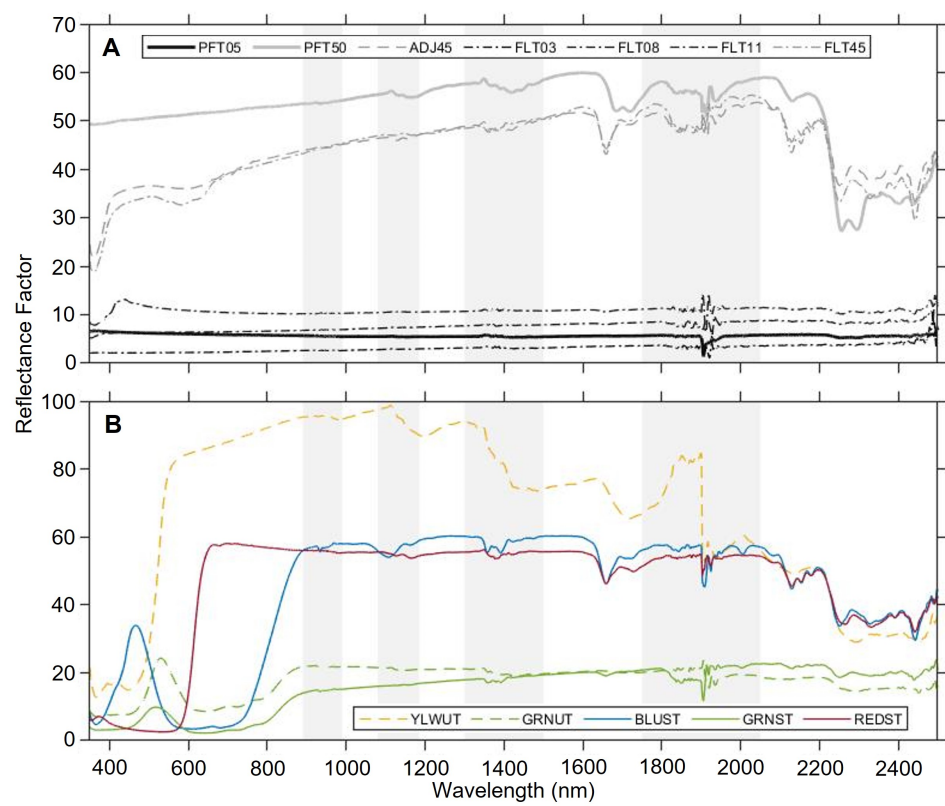
# Supplementary Materials: The Ground to Space CALibration Experiment (G-SCALE): Simultaneous Validation of UAV, Airborne, and Satellite Imagers for Earth Observation Using Specular Targets

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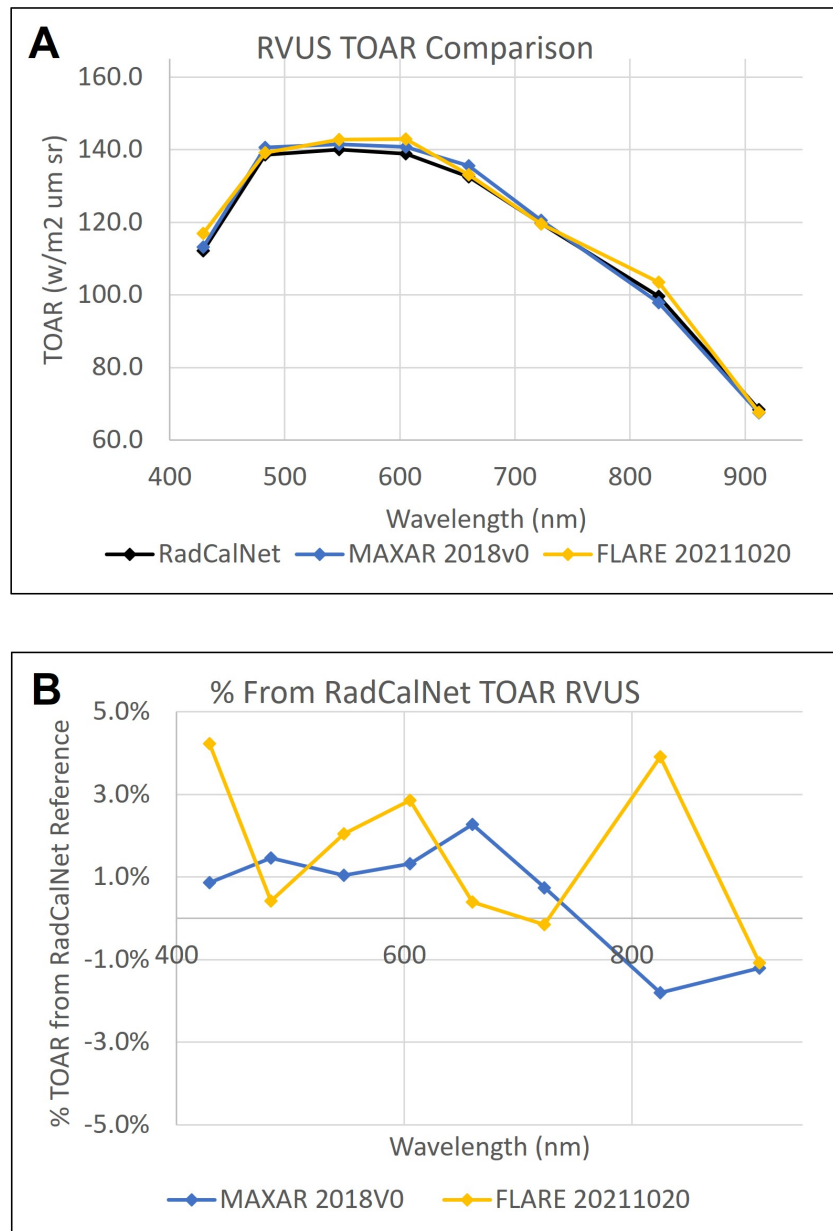
## 1. Supplementary Figures



**Figure S1.** Global, diffuse, and direct solar irradiance at 15:52 UTC (11:52 local), corresponding to the WV2 overpass, airborne collect 4, and the midpoint of UAV surveys (A). Downwelling global irradiance at 550 nm during the course of the experiment showed high atmospheric stability (B). Gaps in data between 15:30 and 16:30 are due to measurements of direct and diffuse components using the monitoring spectrometer.



**Figure S2.** Reflectance spectra of greyscale diffuse reflectance calibration targets were collected during the experiment (A), in addition to lab characterization. In-situ reflectance of colored, spectral signature validation targets were also collected (B). High atmospheric absorption can lead to artifacts in the the shape of naturally illuminated reflectance spectra in certain regions (shaded) due to low signal to noise in scans of both reference panel and target.



**Figure S3.** Experiments using manually deployed SPARC targets and the automated FLARE Network during Summer 2021 generated absolute radiometric calibration coefficients for Maxar's WorldView-3 satellite. These FLARE coefficients, as well as the most recent Maxar calibrations, were applied to an archive of 34 images of the Railroad Valley Playa RadCalNet site and compared to the Top of Atmosphere Radiance product from RadCalNet (A). Both calibration methodologies produced in-band radiance data that agreed to within the products' radiometric uncertainty (B).



**Figure S4.** Landsat 8 observed the Tait Preserve (inset) region simultaneously with G-SCALE. Using large uniform areas in-scene, it will be possible to transfer the SPARC calibration of Worldview-2 and GeoEye-1 to Landsat imagery.

## 2. Supplemental Tables

**Table S1.** Key characteristics of the NRC operated CASI-1500 and SASI-600 Airborne Hyperspectral Systems.

Characteristics	CASI-1500	SASI-600
Serial Number 1	2511	3202
Field of View ( ° )	39.9	39.7
Instantaneous FOV ( ° )	0.0270 (nadir) 0.0246 (edge)	0.0669 (nadir) 0.0587 (edge)
No. Cross-track pixels (detector)	1500	640
No. Cross-track pixels (image)	1496	600
No. Channels	288 (max)	100 (after resampling)
Spectral range (nm)	372 - 1062	957 - 2242
Spectral Sampling Interval (nm)	2.4	15
Spectral Resolution (nm)	3.2	TBD
Frame rate (Frames sec <sup>-1</sup> )	Programmable Max rate dependent on # of channels	60
Integration time (IT) (ms)	1000/Frame rate	<16.0 (Typ 2.0 - 6.0)
Focal Length (FL) (pixels)	2061.1	855.1
Dynamic Range (bits)	14	14
Noise Floor (DN)	1.91 (LHS) 1.86 (RHS)	2.15
System Gain (e <sup>-</sup> /DN)	98.67 (LHS) 91.23 (RHS)	97.01
Max Data Rate (MB/Sec)	20.0	10.0