High-Accuracy Hyperspectral Ground Truth Reflectance Techniques – Field Methods, Analysis Tips, and Theoretical Considerations.

The MISR (Multi-angle Imaging Spectro-Radiometer aboard Terra) Calibration and Validation team at JPL employs a suite of ground-based radiance measurements to derive multi-angle TOA (Top Of Atmosphere) radiance predictions. Collected during Terra overflights and concurrently with visible & near IR downwelling radiance and upwelling hemispherical BRF measurements, hyperspectral nadir ground reflectance is a key parameter. Driven by a requirement of 3% on-orbit radiometric accuracy, techniques have been developed to routinely ensure 1-2% error of in-situ reflectance measurements of large homogeneous ground targets such as playas and pans. From the care and feeding of reflectance standard panels to the whys and wherefores of field methodology, the author will present the various steps taken by MISR Cal/Val both in the field and during analysis that contribute to overall reflectance certainty, as well as the theory behind them.
MISR/JPL Portable Ground Truth

Anytime...

Campaign Heritage:
FIFE, BOREAS, SAFARI 2000

Anyplace...

Decade+ of Experience
Domestic & Foreign Ops

Anything...

Experimental Heritage: AVIRIS, Landsat, ASAS, AirMISR/MISR, AIRS

MISR Ground Truth
Logistic Capabilities

Deployment Flexibility

Self-Contained

Autonomous Operation

Solar Power

Modular Transport

Portable Instruments

Domestic On-Site Mobile Lab

MISR
Ground Control
Some Operational Solutions

Handling H₂O

Outreach = Local Goodwill...

...Overall Safety...

...In All its Forms:

Mobility, Over Large Targets!

MISR
Ground Truth

Local Wildlife

Local Wildlife Control

...and Cooperation

Sometimes It's All That's Needed
Pedal Power!
ASD Field Spectrometer

Instruments & Data Products

Spectral Nadir Reflectance
350 to 2500nm.
2% Radiometric Accuracy
≈1m Scale Over Km²

PARABOLA Spherical Scan of Sua Pan, Botswana, 860nm
Calibrated Radiance in Units of Watts/(m²-strad-micron)

MISR Ground Truth

Spherical Radiance & HDRF,
5° Angular Resolution, 8 Bands, 440 to 1650nm
**Instruments & Data Products**

Met Package Measures:
Ambient Temperature, Humidity,
Wind Speed & Direction

**SAFARI 2000, 27Aug & 03Sep, Sua Pan, Botswana**

![Graph showing Optical Depth vs Wavelength](image)

**YES Shadowband Radiometer**
YES MFRSR Measures:
Total & Diffuse Sky Radiance,
Direct/Diffuse Ratio,
7 Bands, 440 to 880nm

**Meteorology Package**

**CIMEL (#59 of AERONET) Measures:**
Optical Depth, Sky Radiance Map,
9 bands, 440 to 880nm,
& 3 Polarizations @ 880nm

**UofA ‘Reagan’ Measures:**
Direct-Beam Optical Depth,
10 Bands, 380 to 1030nm
(Three Instruments Available)
Instruments, Data, Support, & Services

**Kipp&Zonen**
*VisNIR Albedometer*
*Eppler IR Pyranometer*

**Measures:**
- Broadband Albedo
- 0.3 to 3 μm
- Integrated Downwelling Radiance
- 0.3 to 12 μm

**Suva Pan**
**Botswana**
Georectification Points, Lat/Lon

**Recording GPS Measures:**
- Georectification Points
- Roads, Geographic Outlines

- **Support Hardware / Software Includes:**
  - PC & MacOSX (UNIX) Laptops
  - 100Gb+ Storage Capacity
  - IDL Processing & Analysis Code
  - Digital Video & Photo Documentation

* Experimental Design Consultation,
* Advisory Support, & Training are Also Available
## Instrument & Product Summary

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**Top-Off Instrument Radiative Rejection, Direct and Diffuse Reflectance, Overlying Aerosol Models & Cloud Radiance Map.**

**For More Info Contact:**
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