

Exercise B: Demonstration of reflectance sensors
Field Phenomics Workshop, Maricopa, Arizona
Monday, April 7, 2014 2:30pm
Instructors: Kelly Thorp and Pedro Andrade-Sanchez

Logistics for Participants

- We need to split into two groups
- We will step outside for the demonstration. Please wear a hat and prepare for sun.

Objectives

- I. Understand principles of ground-based spectral reflectance measurements in the field.
- II. Become familiarized with field deployment of active spectral sensors

Group A - Passive spectroradiometer demo (Thorp)

- I. Understand the light source: direct sunlight, diffuse radiation, scatter from surroundings.
 - A. The sun (and all matter) emits radiation with a characteristic spectrum.
 - B. Emitted radiation from the sun travels to Earth (wave behavior of light).
 - C. Light from the sun interacts with Earth's atmosphere (diffuse radiation).
 - D. Direct and diffuse radiation reaches Earth's surface, interacts with surroundings.
 - E. What factors affect radiation received at a given point on Earth's surface?

- II. Understand the ASD FieldSpec spectroradiometer.
 - A. Quantifies radiation entering the fiber optic cable.
 - B. Prism partitions radiation by wavelength.
 - C. Partitioned light interacts with photo-detector (particle behavior of light).
 - D. Quantifies amount of radiation from 350 nm to 2500 nm in 1 nm increments.
 - E. This is a \$65,000 instrument.
 - F. What are the pros and cons of using this instrument for field phenomics?

- III. Understand the Spectralon reflectance standard.
 - A. Spectralon is a material that reflects 99% of incident radiation.
 - B. Spectralon is a material that approximates an ideal diffuse (Lambertian) reflector.
 - C. A Lambertian surface reflects light equally in all directions.
 - D. Spectralon panels provide a reference for incident radiation.
 - E. Why must Spectralon panels be properly maintained?

- IV. Perform tests with the spectroradiometer
 - A. Solar Angle Test - What happens to incident solar radiation over time?
 - B. Cloud Effect Test - How can changes in cloud cover affect spectral readings?
 - C. Shirt Test - How might human proximity to sensors affect spectral readings?
 - D. Soil-Vegetation Test - Why does vegetation reflect light differently than soil?

Group B - Active sensor demo (Andrade-Sanchez)

- I. System preparation before field work
 - A. Replaceable optical filters
 - B. Sensor calibration
 - C. Sensor mounting in platform
 - D. Quick review of field-ready data acquisition system

- II. Perform tests with CropCircle ACS-470 sensor
 - A. Sensor deployment in a range of distance away from target
 - B. Sensor deployment over different targets
 - C. Handle data storage media

- III. File processing
 - A. Open practice files in MS Excel
 - B. Organize data columns
 - C. Compute vegetation indices (i.e. NDVI and SR)
 - D. Draw conclusions on height effect and reflectance of different targets