

CALIBRATION OF THE NATIONAL ECOLOGICAL OBSERVATORY NETWORK'S AIRBORNE OBSERVATION PLATFORM

Nathan Leisso

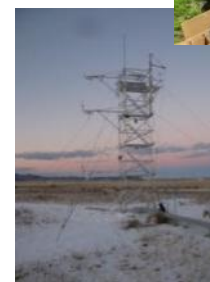
August 29, 2012

NEON OBSERVING SYSTEMS

- Terrestrial observing system (organismal biology)
- NEON collections
- Aquatic observing system (organismal and instrumental)
- Terrestrial instrument system (climate, biogeochemistry, soils)
- **Airborne observing system (remote sensing)**
- STREON
- Mobile deployable platform
- Land use analysis package (integration with national data sets & satellite data)



Field
sampling



Towers



Surface
and
ground
water



Airborne
Remote
Sensing

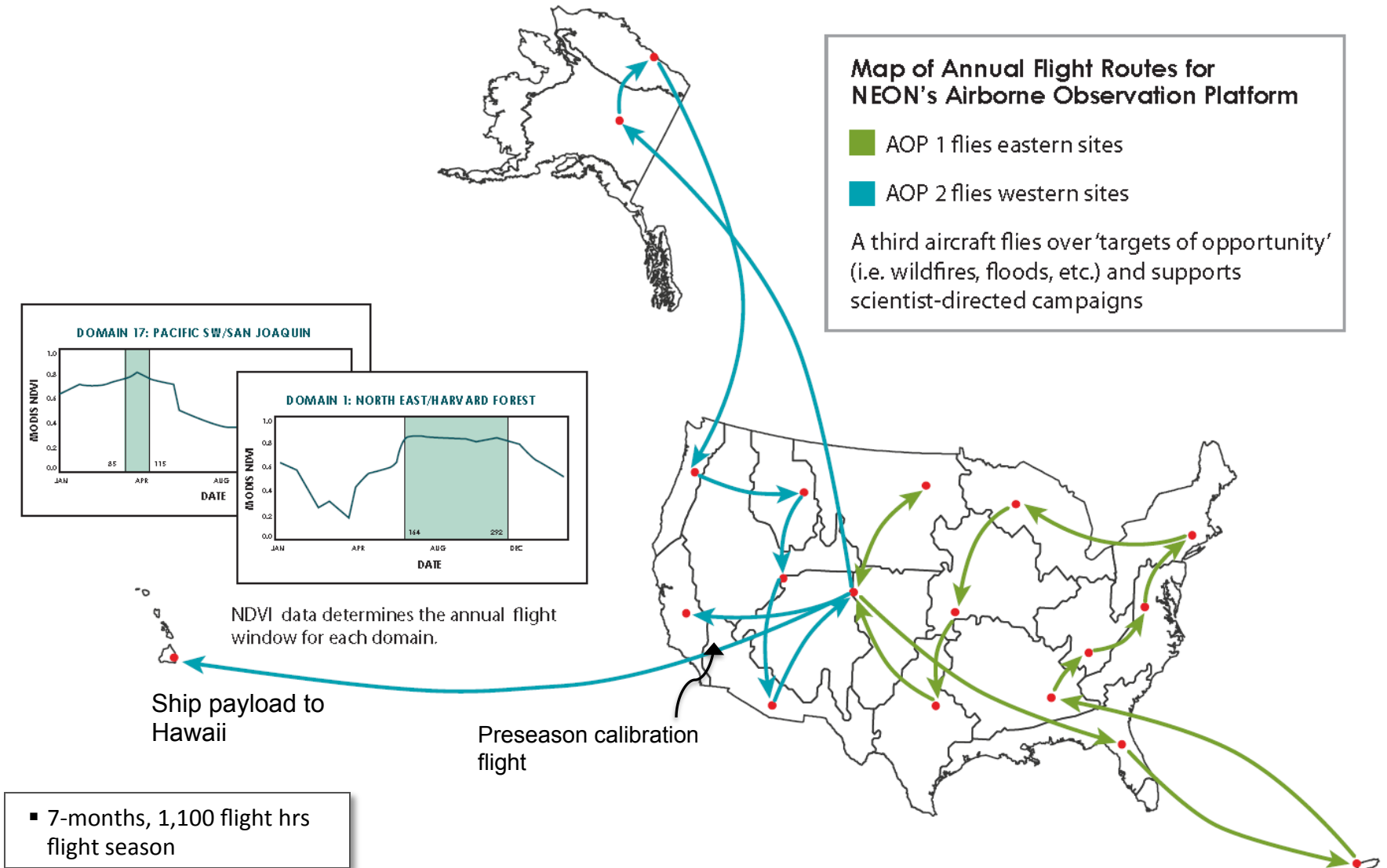


Satellite Data

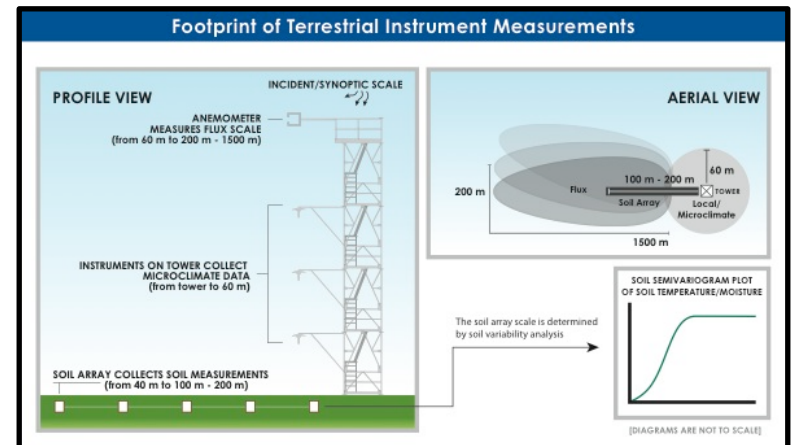
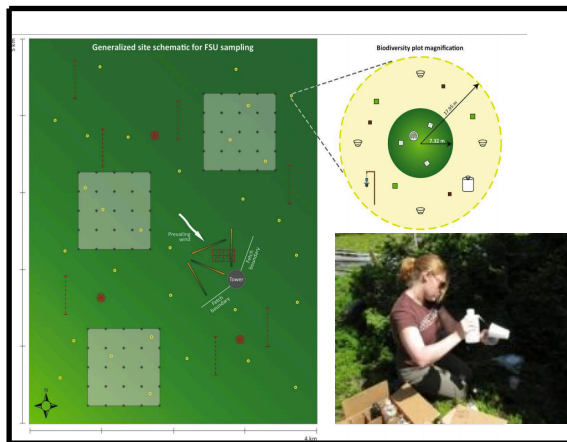
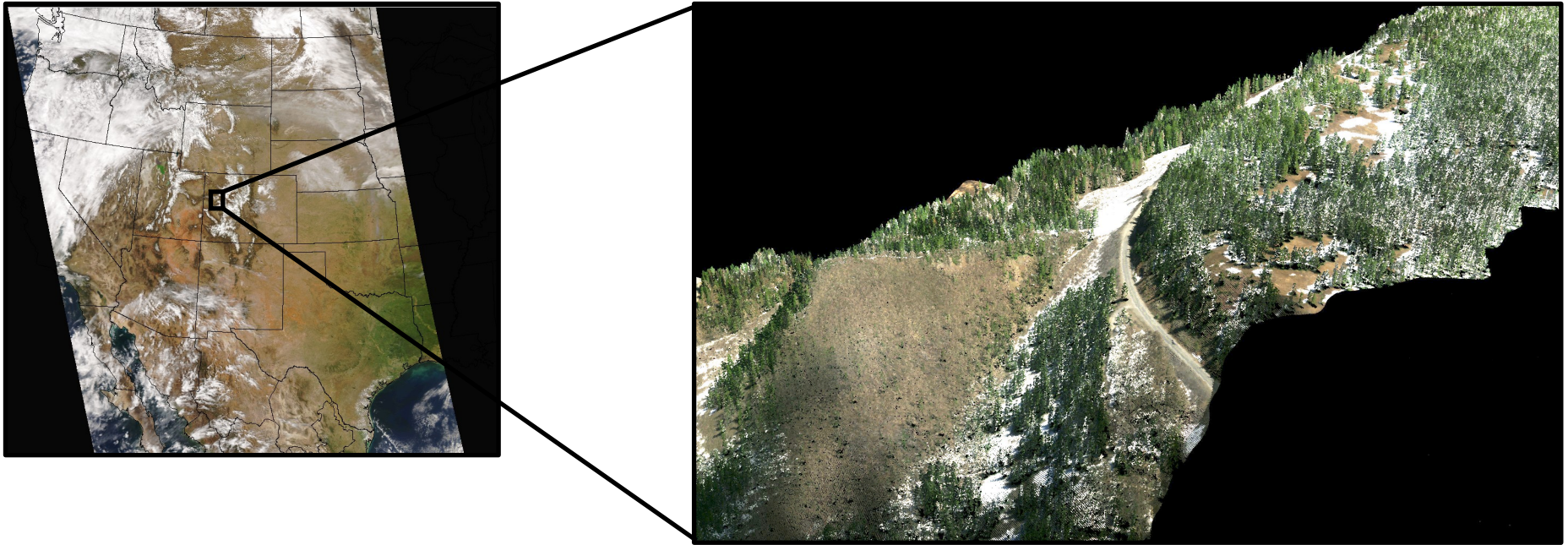
Continental Scale Sampling by NEON



Baseline Flight Operations



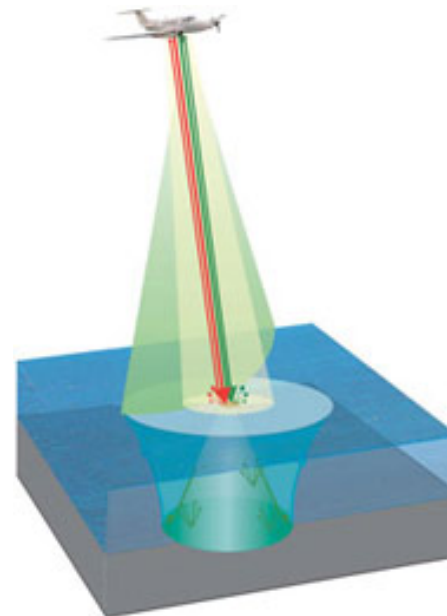
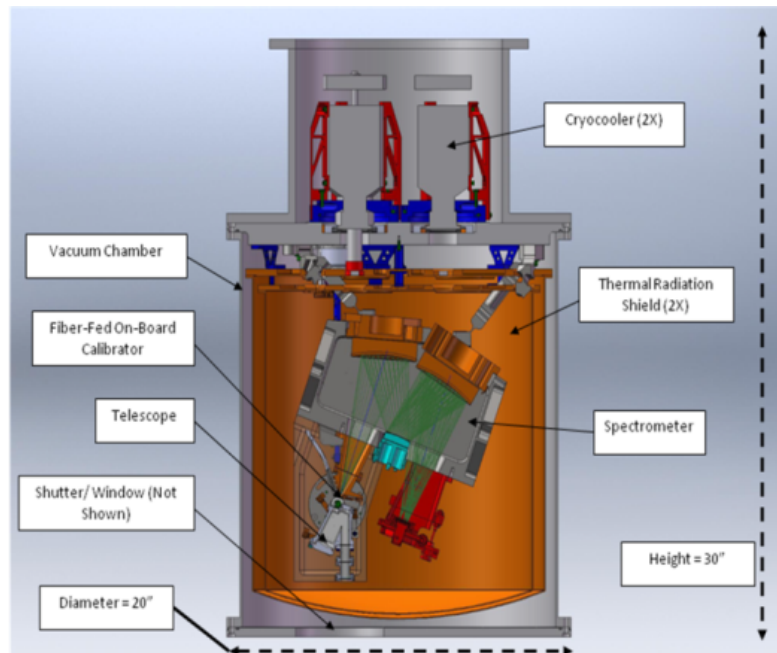
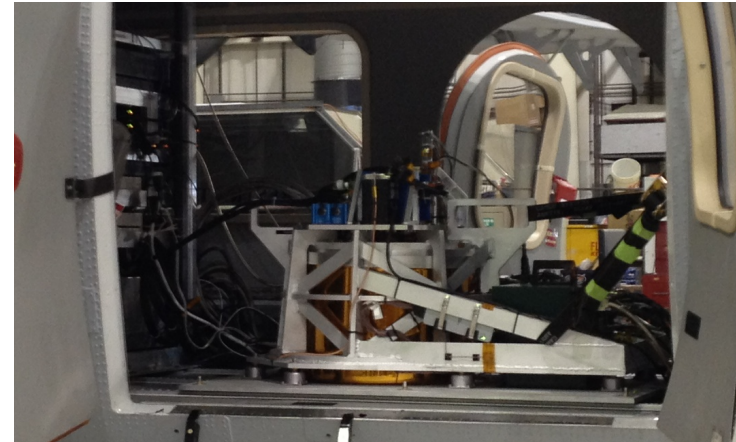
Airborne Remote Sensing in NEON



NEON Airborne Observation Platform (AOP)

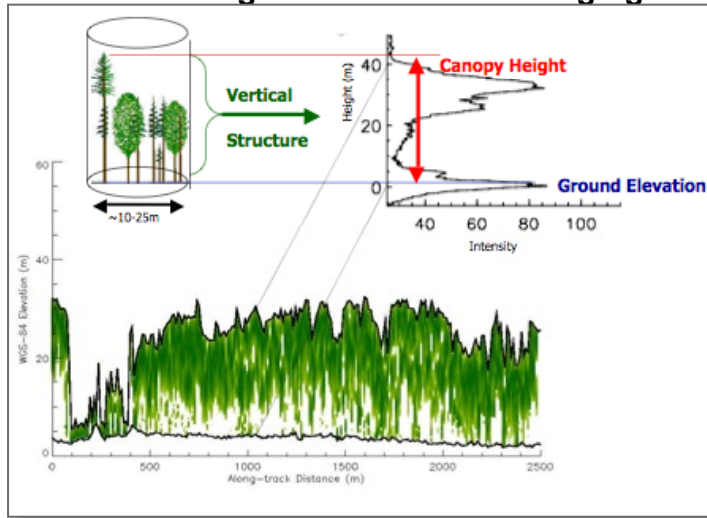
Airborne Instrumentation

- Waveform-LiDAR
- NEON Imaging Spectrometer
- Airborne digital camera
- GPS/Inertial measurement unit



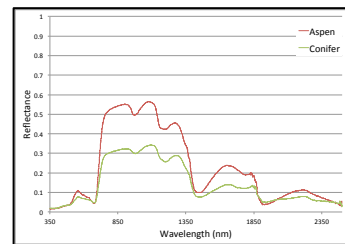
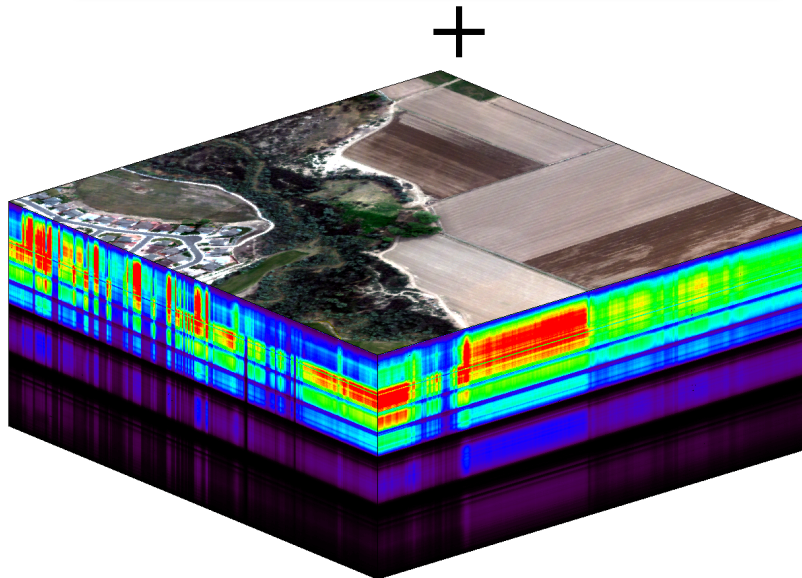
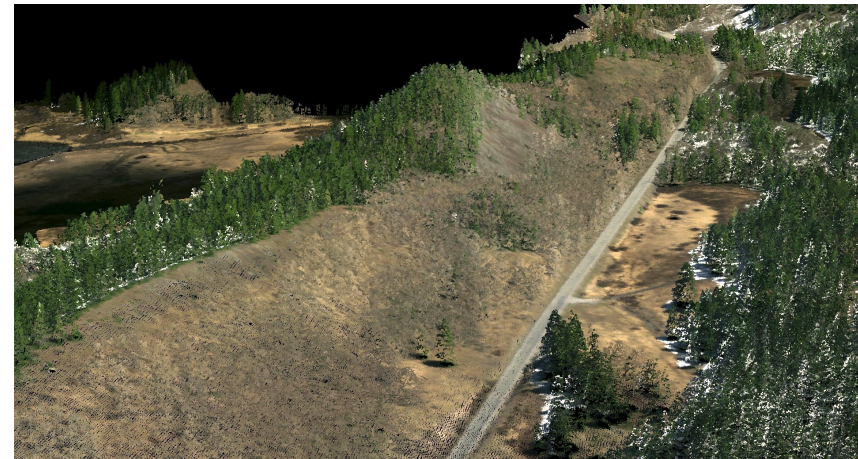
Integrated Observations

Waveform Light Detection and Ranging

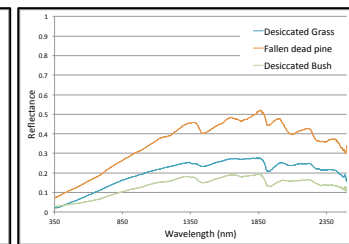


What are we after?

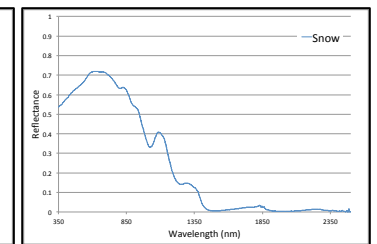
- Detailed chemical, structural and taxonomic information on ecosystems at fine spatial resolution



Aspen & Pine



Dead Grass



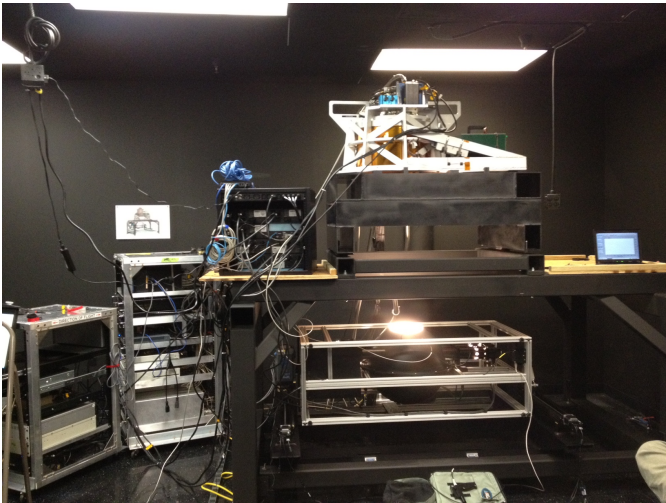
Snow

2012 Flight Campaigns

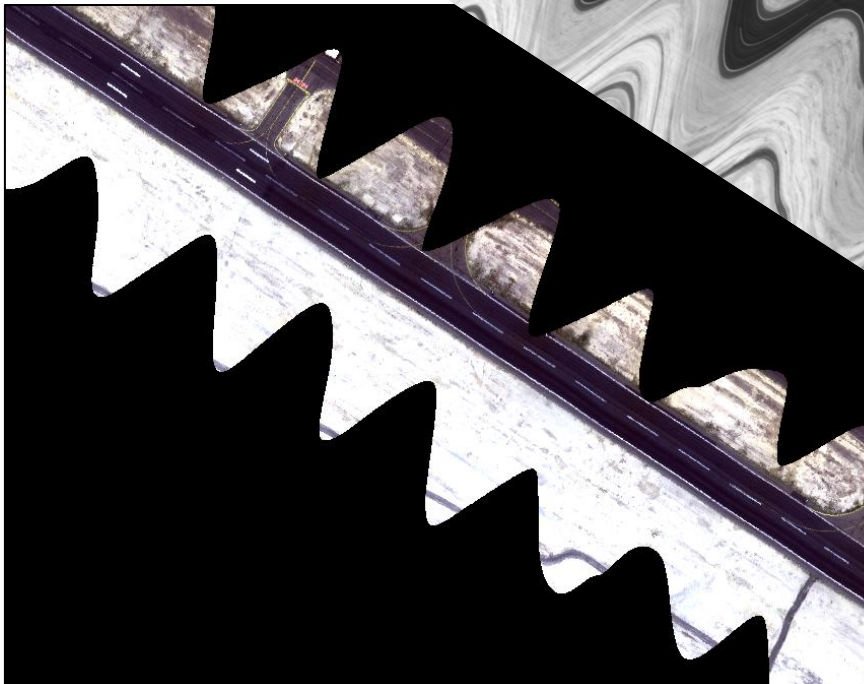
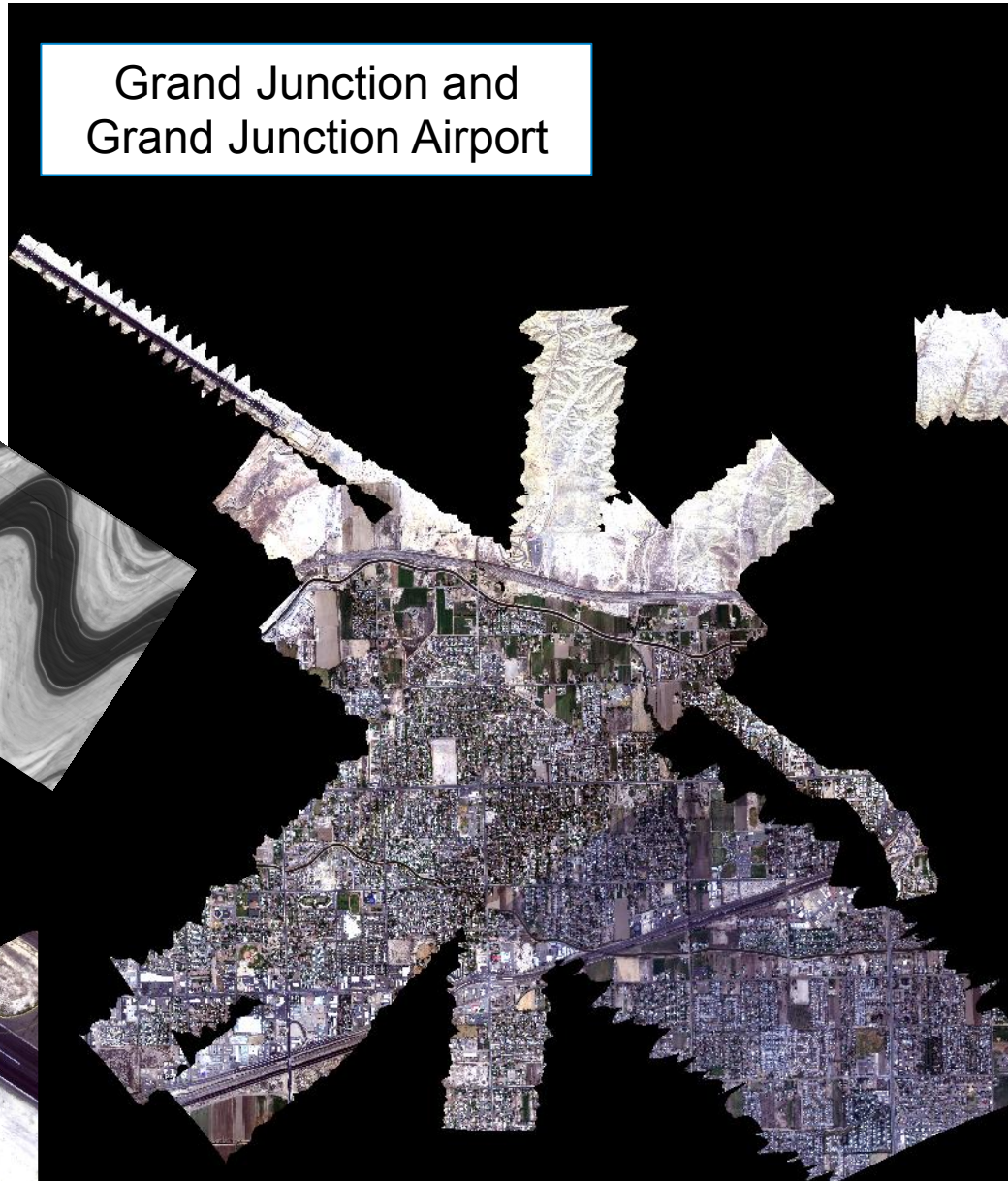
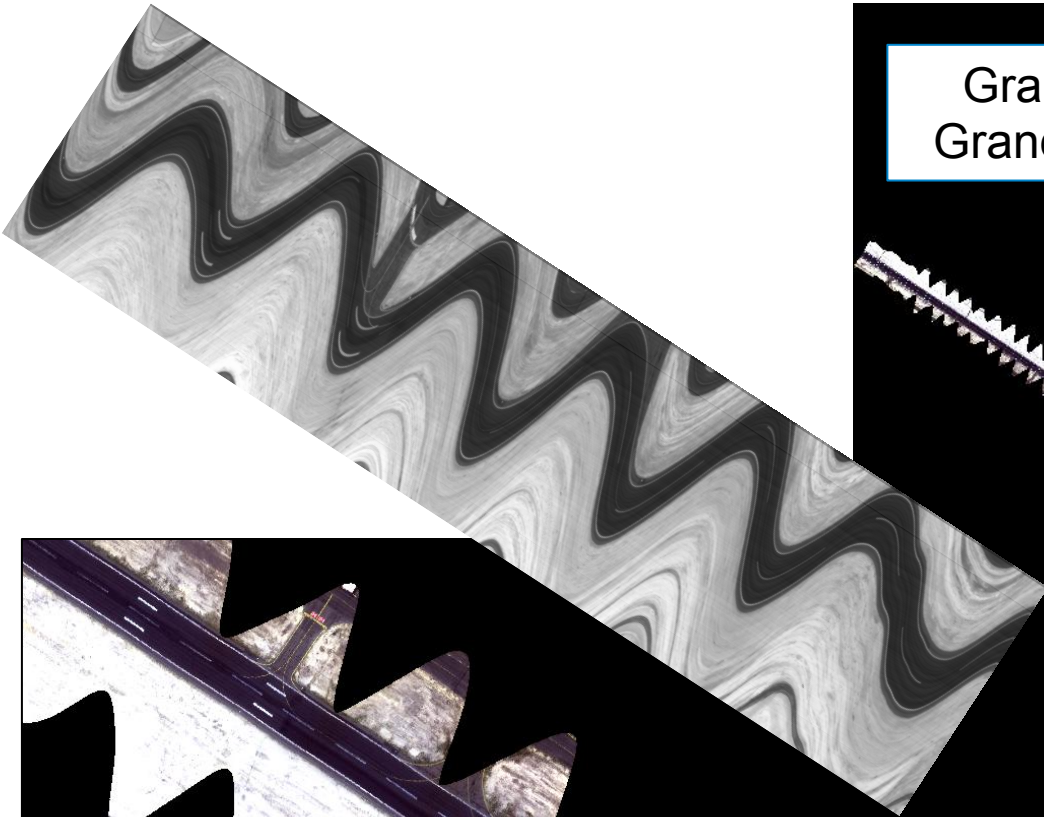
- Grand Junction, CO
 - Installation and test flights
- Ivanpah, CA
 - Calibration and validation
- Harvard Forest, MA
 - First AOP collection of a NEON site
- High Park fire, CO
 - Rapid response to a natural disaster



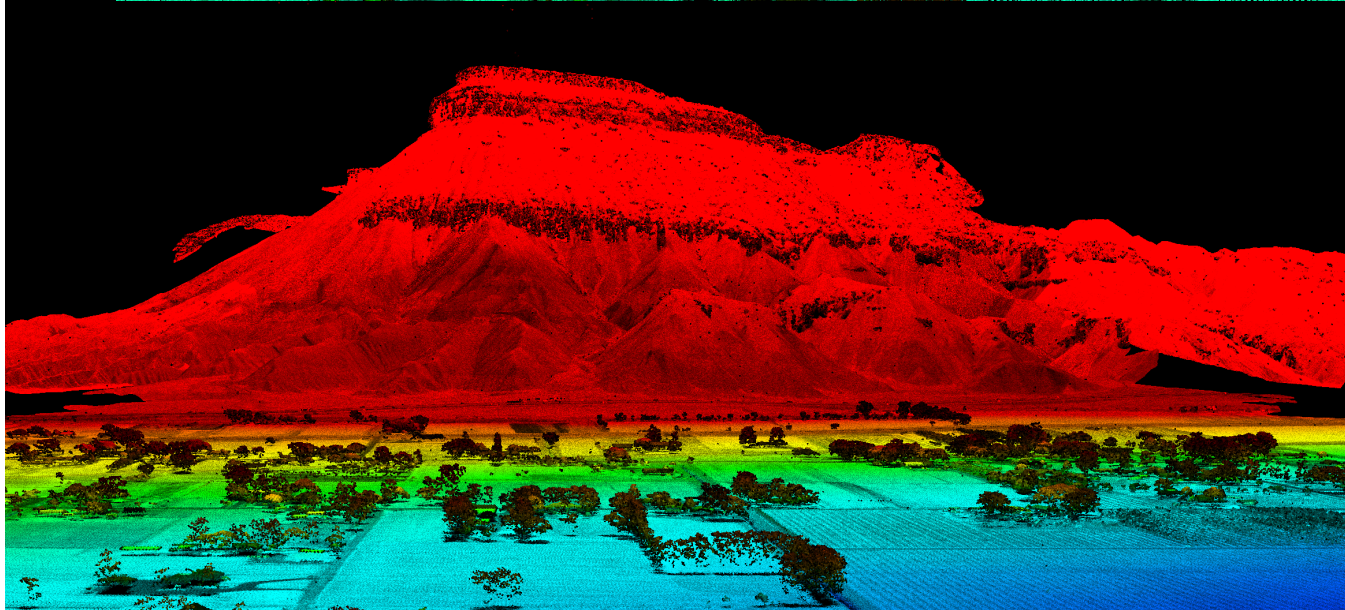
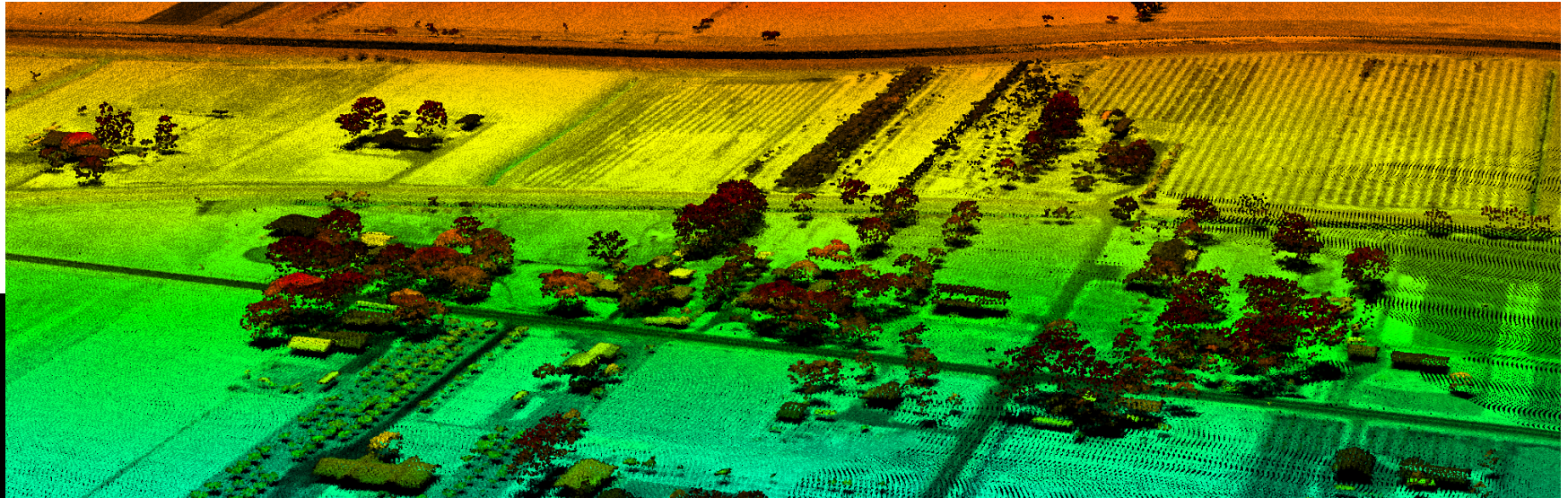
Grand Junction, CO



Grand Junction and
Grand Junction Airport



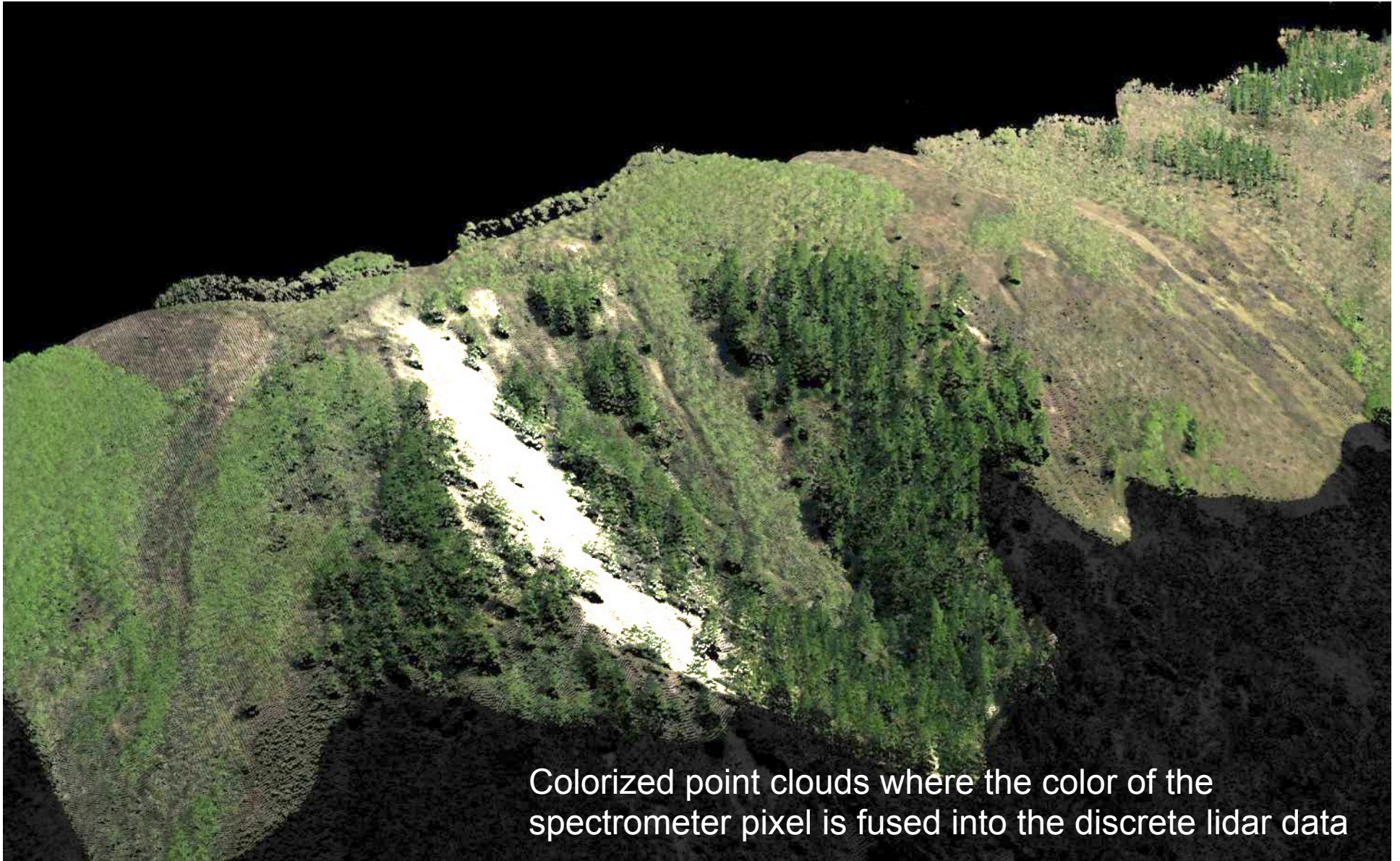
Mt. Garfield/Grand Junction



Spectrometer data overlaid on Lidar point cloud



Grand Mesa, Colorado

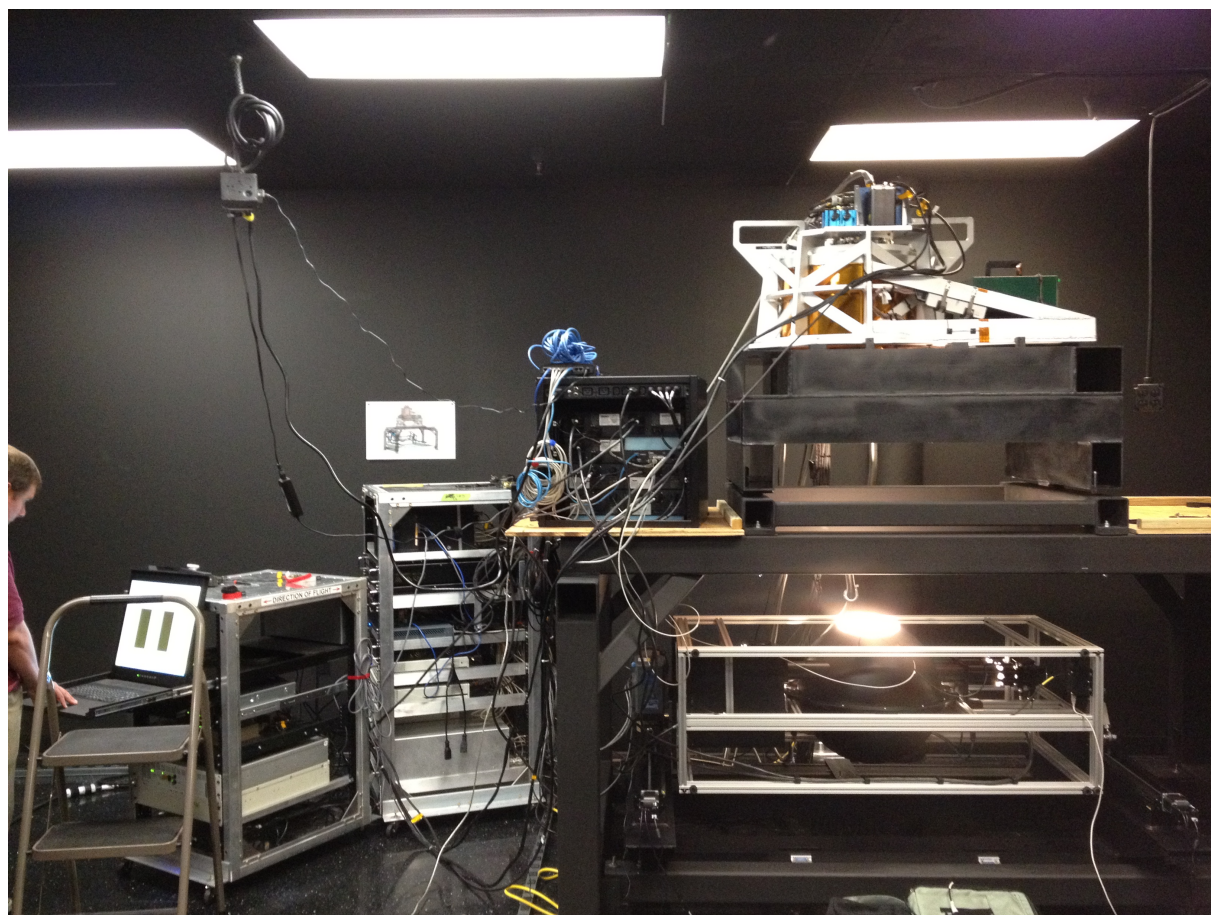


Colorized point clouds where the color of the spectrometer pixel is fused into the discrete lidar data

The NEON Sensor Test Facility (STF) is under construction to provide an resource for the consistent calibration of the Airborne Observation Platform to enable to collection of high quality data.

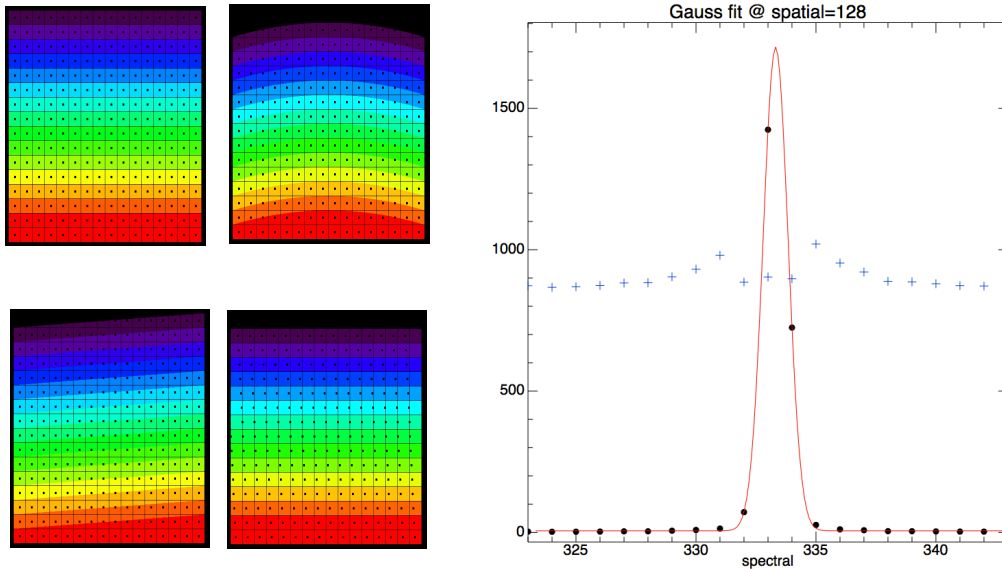
- Integrating Sphere
 - Radiance coefficients
 - Range and linearity
 - SNR
 - Bad pixel map
 - Spectral uniformity
- Monochromator with BIP
 - Spectral response function
 - Out-of-band response
- NIST Lamp-panel-sensor test set
 - Radiance coefficients
 - Spectral uniformity

Integrating Sphere Test Station

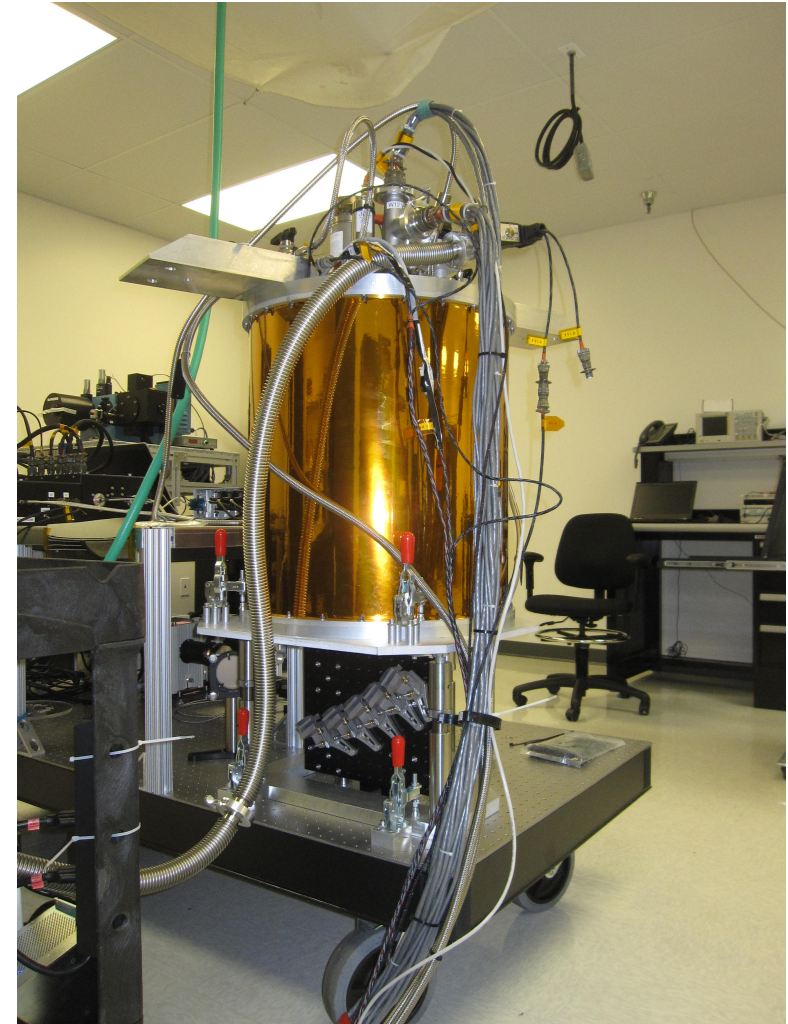
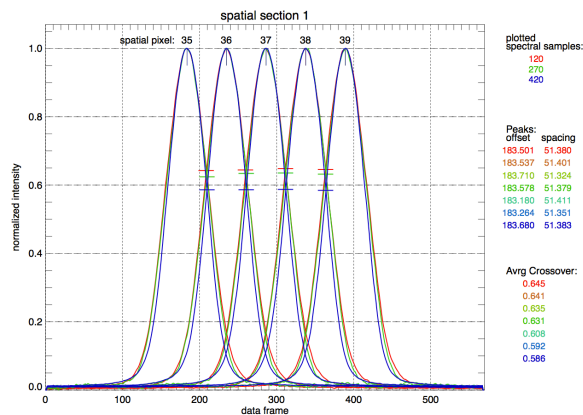


Bi-stimulus Injection Platform

Scanning Monochromator

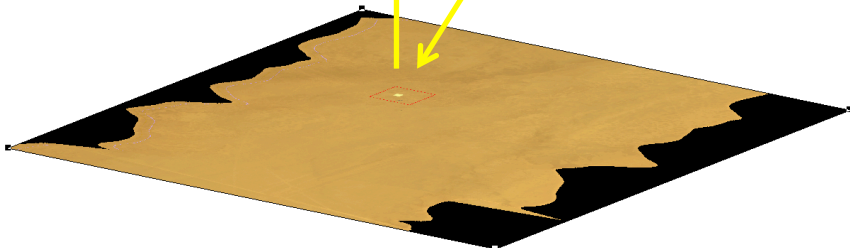
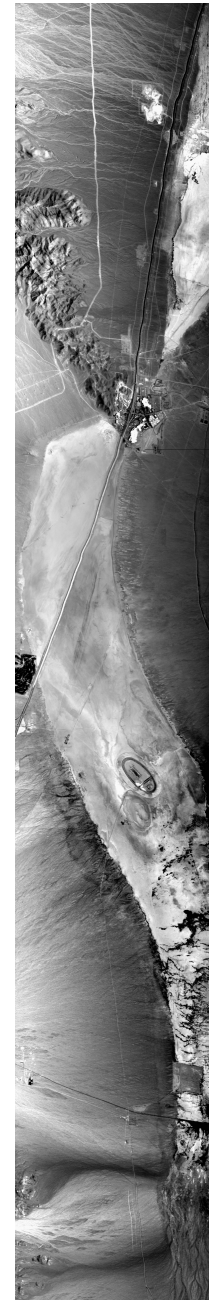
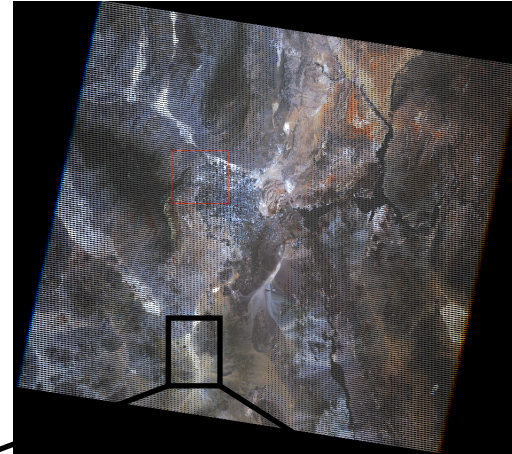
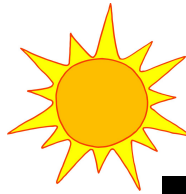


Along-track and Cross-track Response

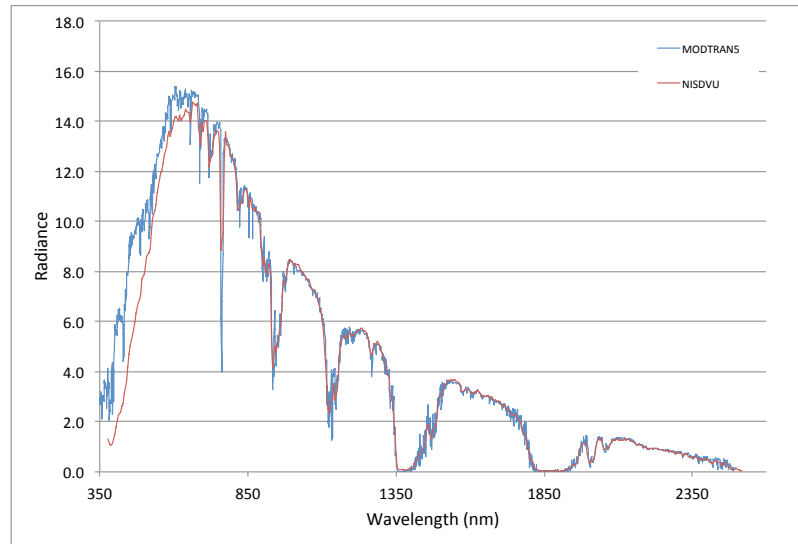
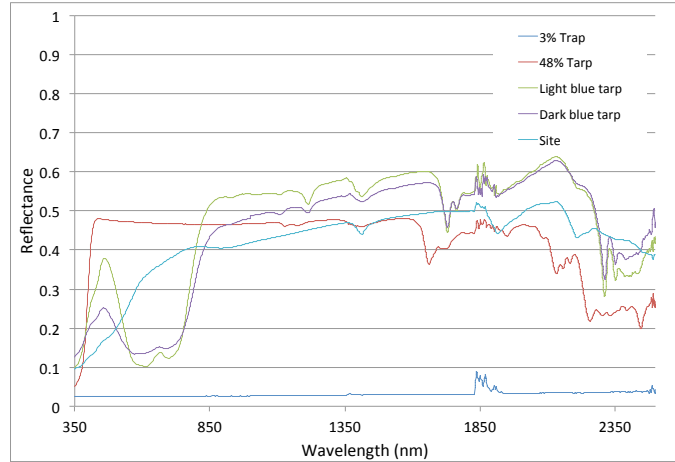
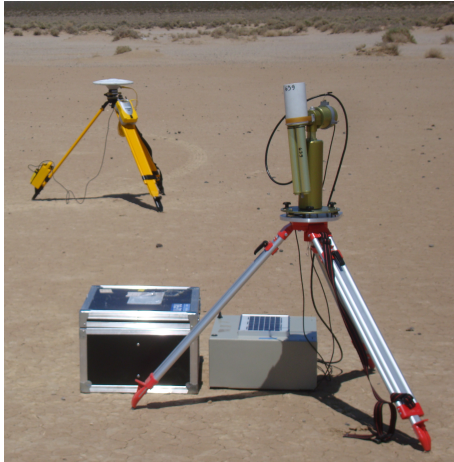


Ivanpah Playa, CA

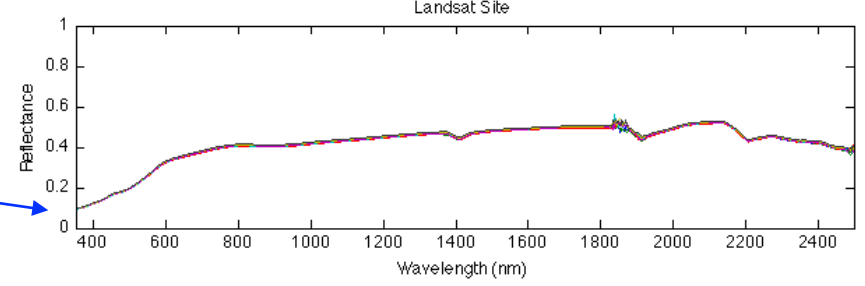
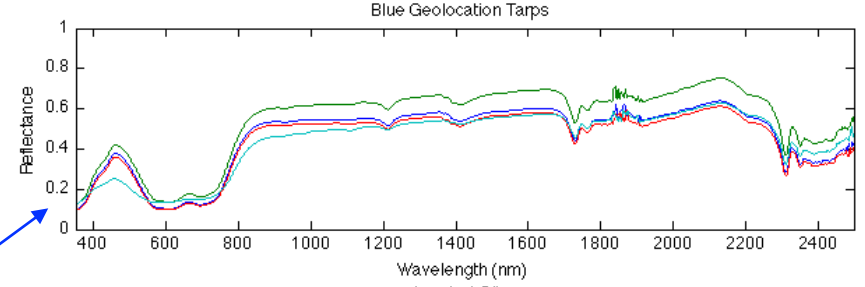
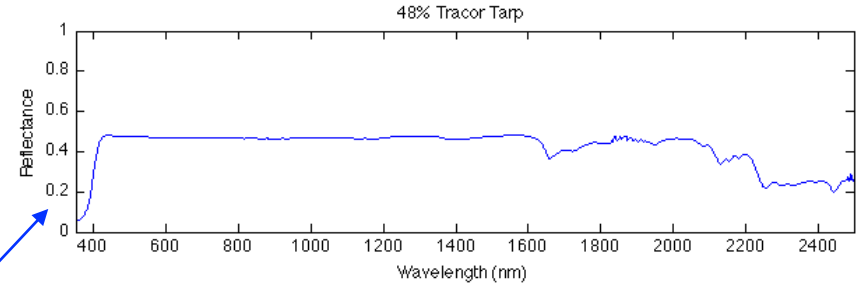
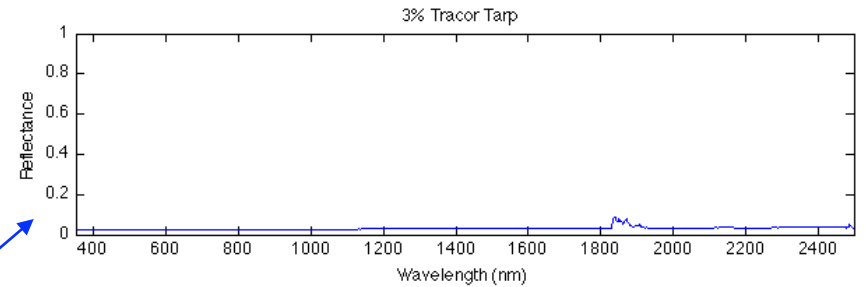
- Validate the radiometric calibration of Spectrometer
- Validate geolocation of airborne data
- Validate atmospheric correction and reflectance retrieval



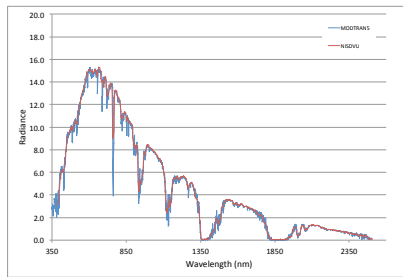
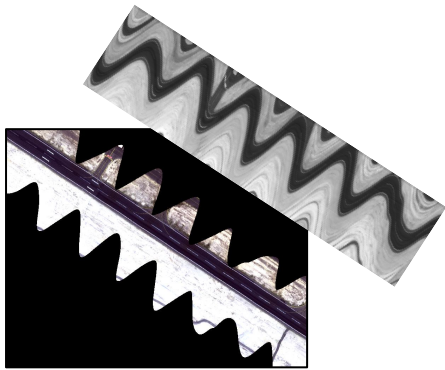
Reflectance-based Method



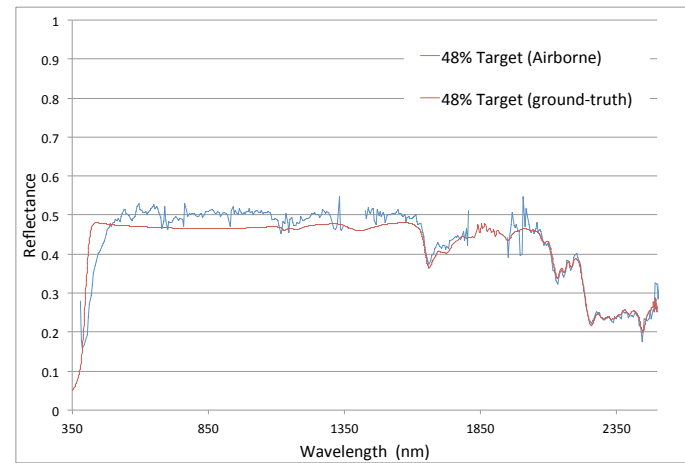
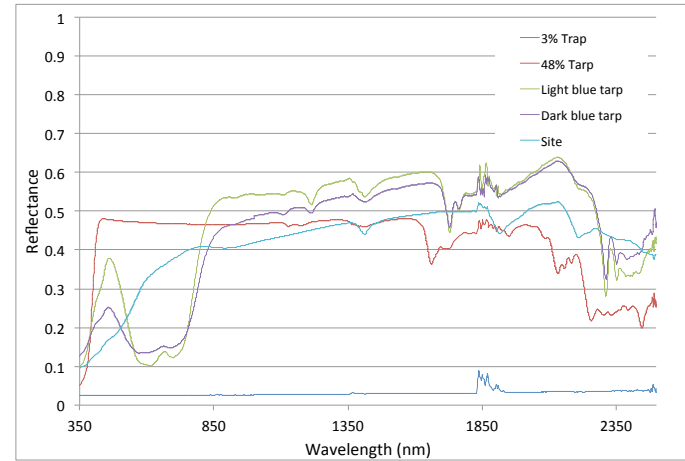
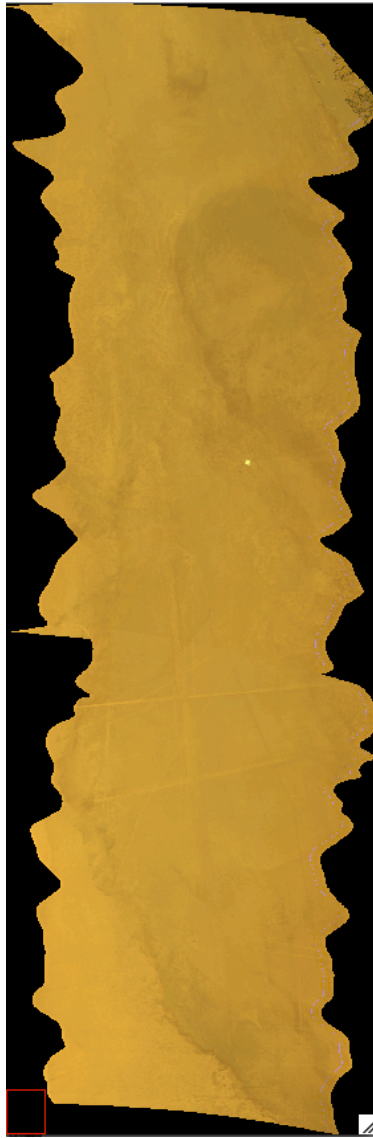
Radiative Transfer Code



Raw Spectrometer Image



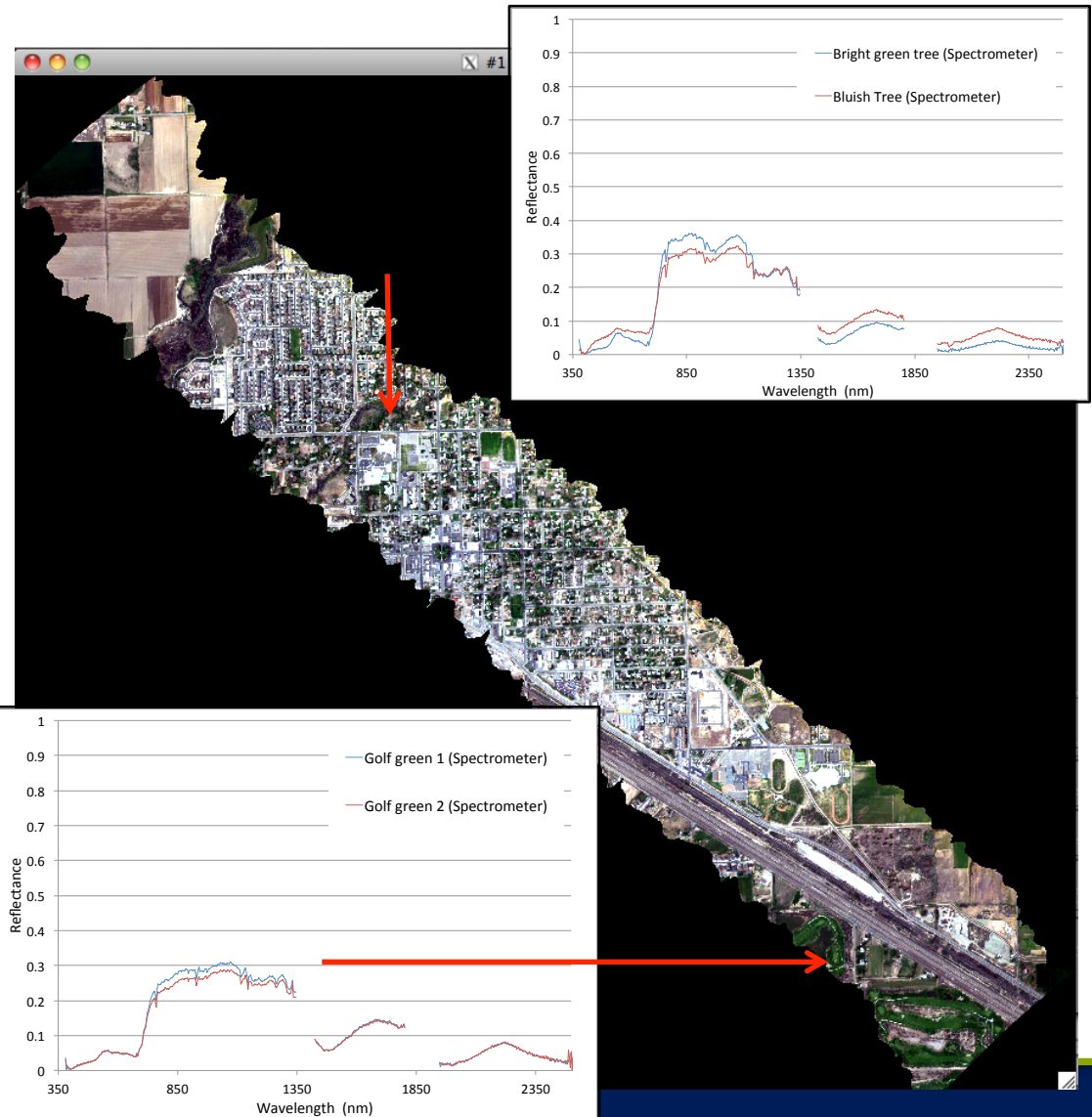
Geolocated and converted to radiance



Atmospherically Corrected Reflectance image of Fruita, CO

Data Products

- Atmospheric correction used to determine surface reflectance.
- Higher level data products derived from reflectance.
- NEON working to test several atmospheric correction algorithms.
- Compare in-situ reflectance to atmospherically corrected spectrometer data to improve results.



Conclusion

- NEON's airborne capability is beginning to come online
 - Initial calibration flight campaigns went well
 - Working on construction of Laboratory facilities to ensure an accurate calibration
 - Developing improved calibration procedures and protocols
 - Work on algorithm development for higher level data products
 - Begin planning flight campaigns for 2013
- Data Availability
 - Data from all flight campaigns will be made available via NEON web portal

