NEON REMOTE SENSING DATA

LeahAWasser

National Ecological Observatory Network

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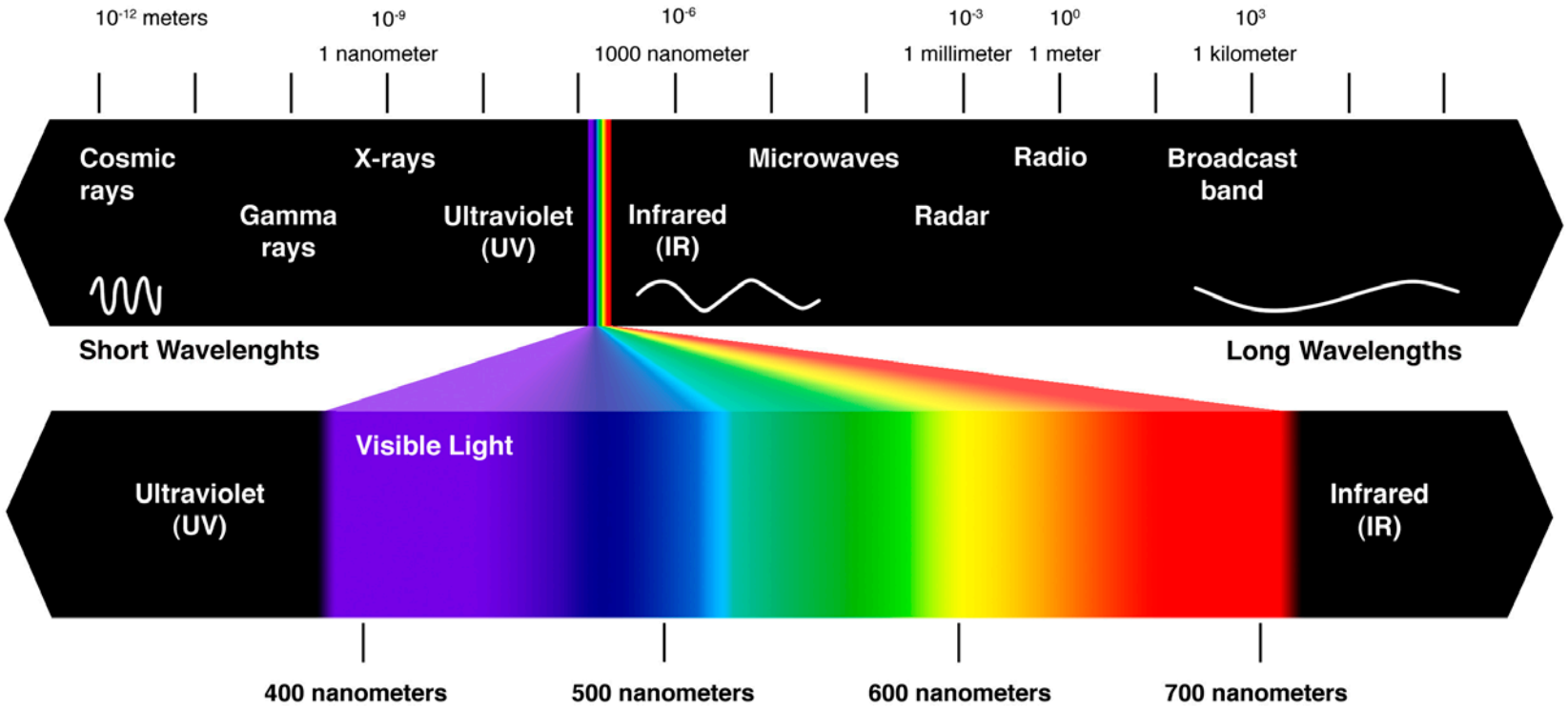

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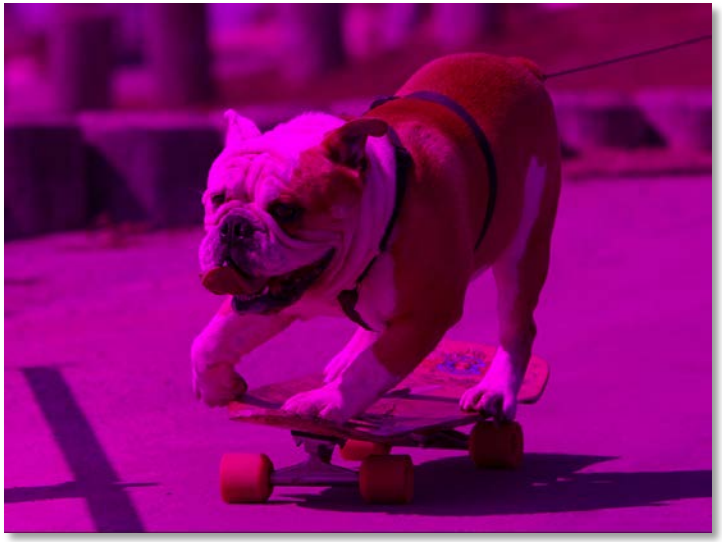
Blue Band

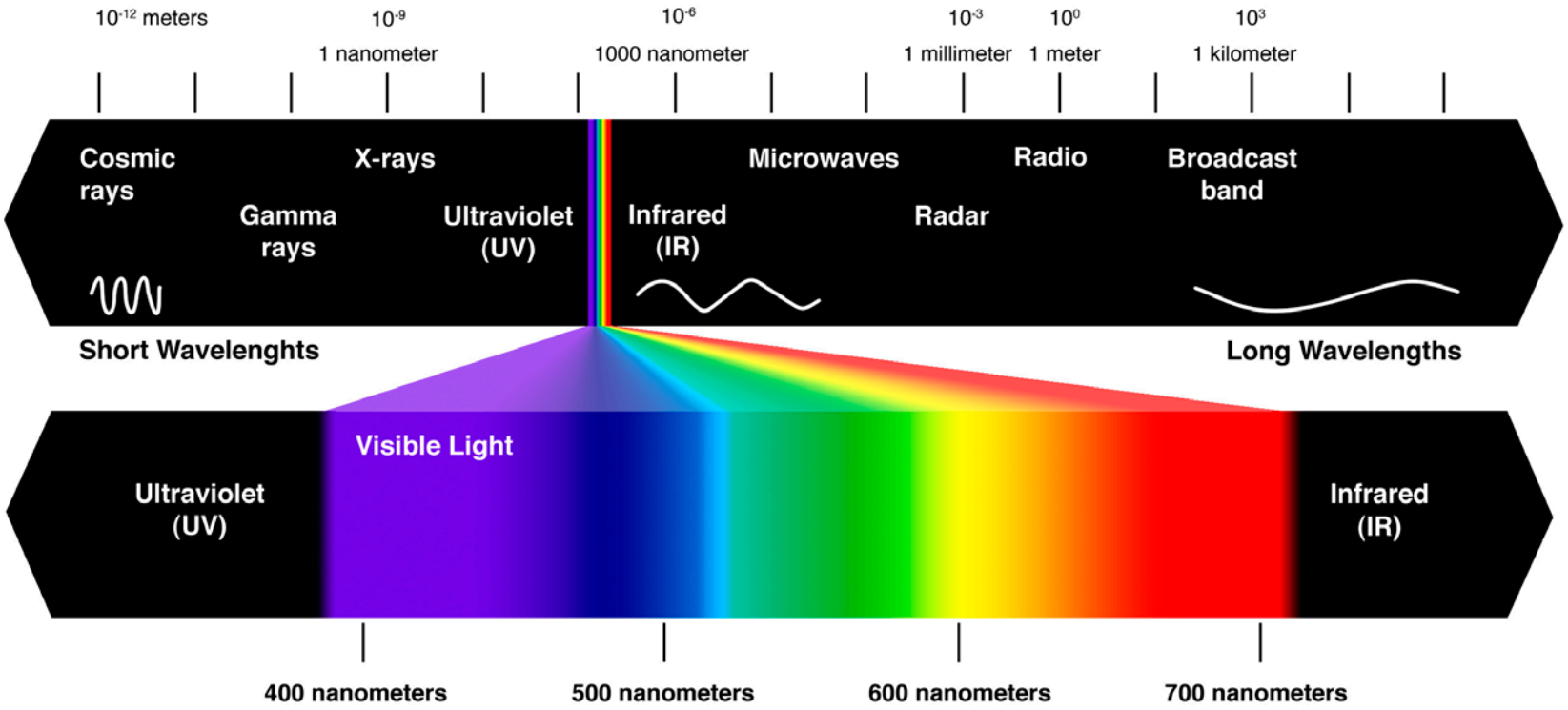
Green Band

Red Band

Blue + Green



Red + Blue = psychadelic bulldog



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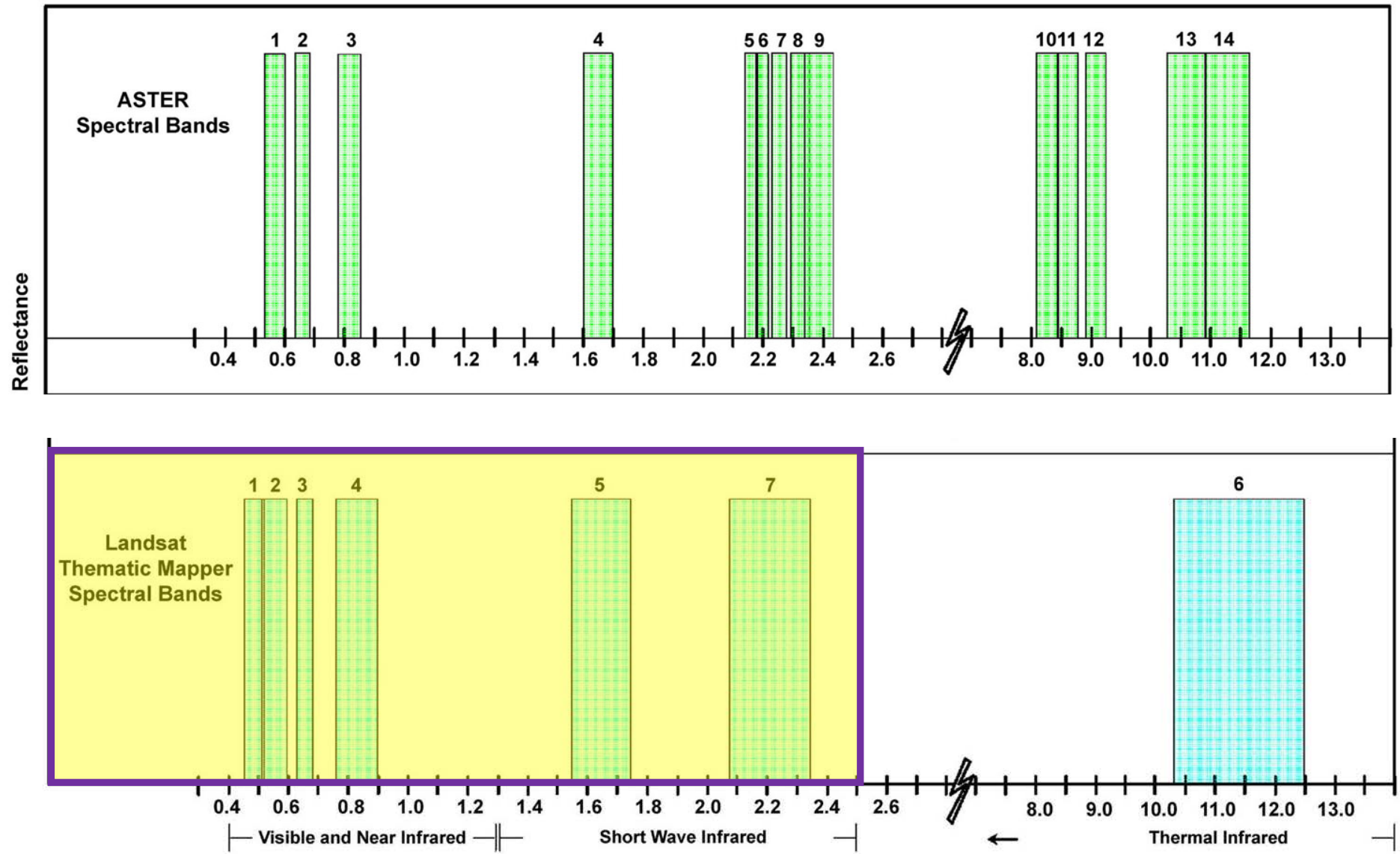
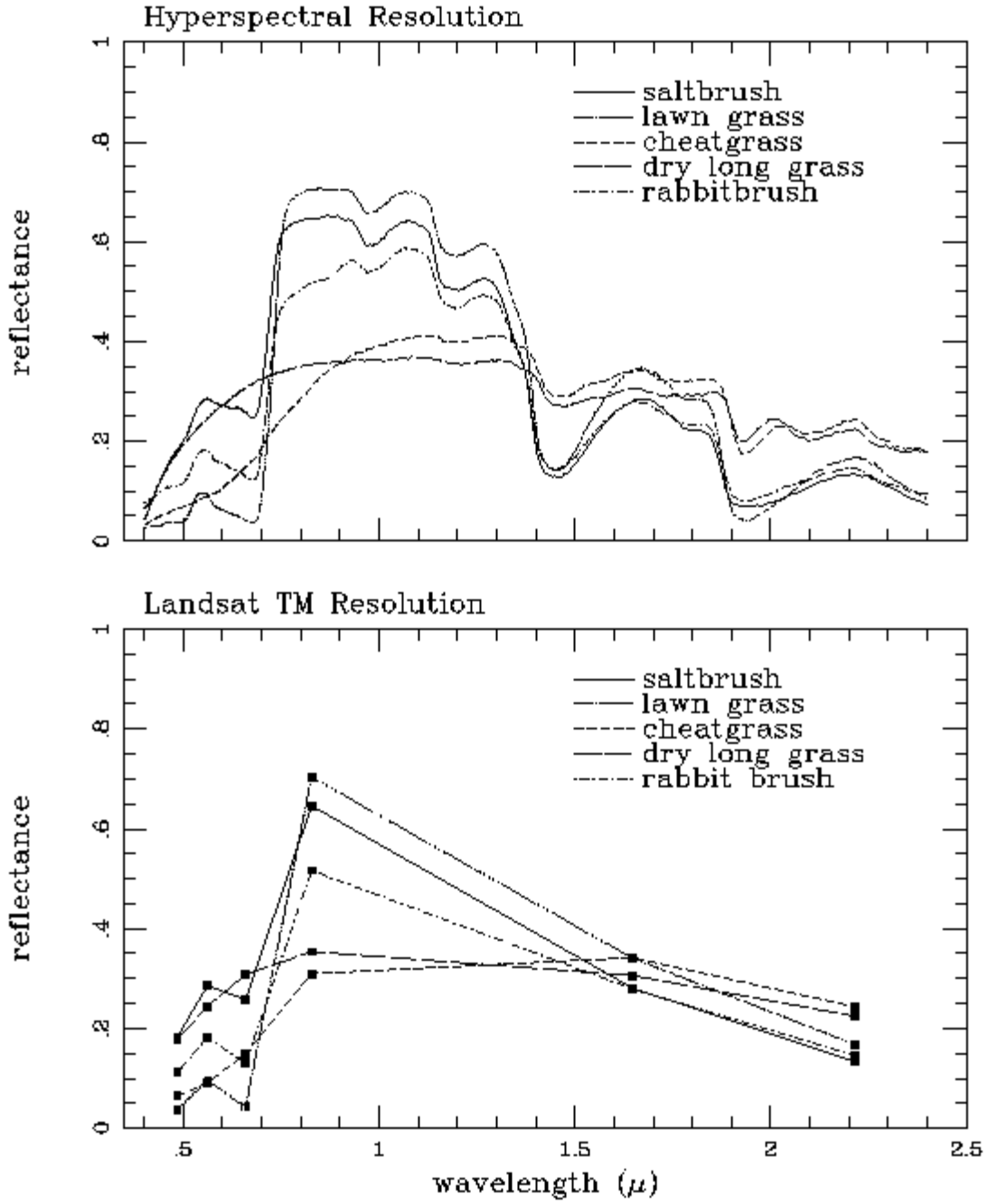
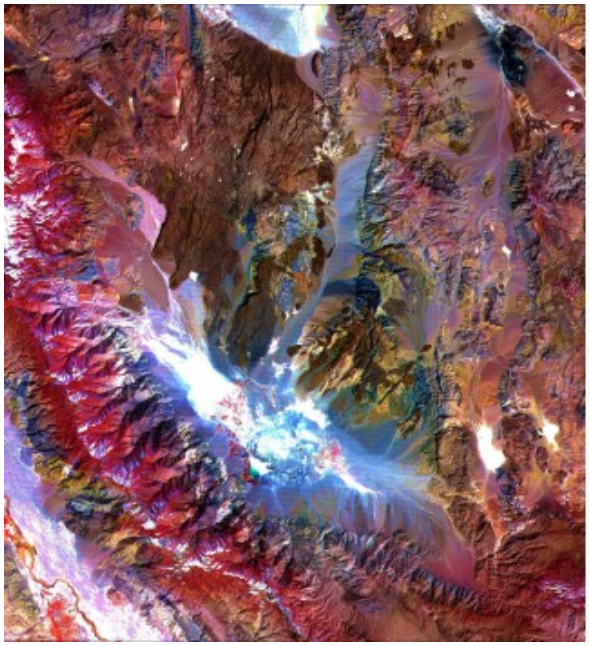
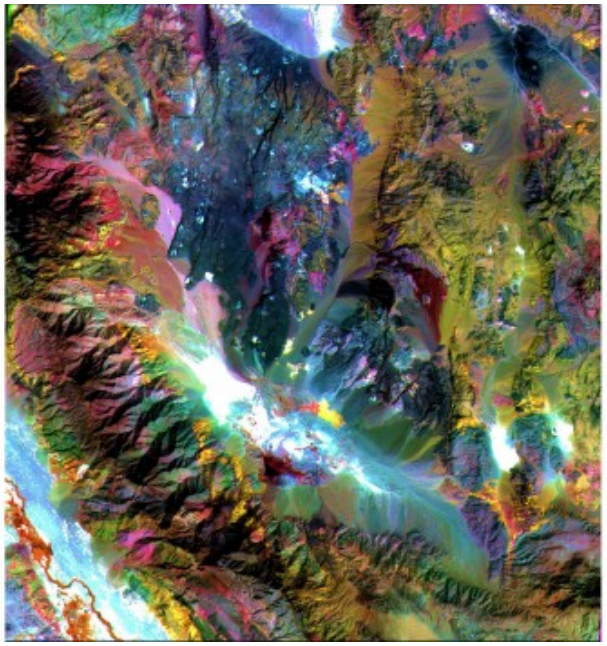
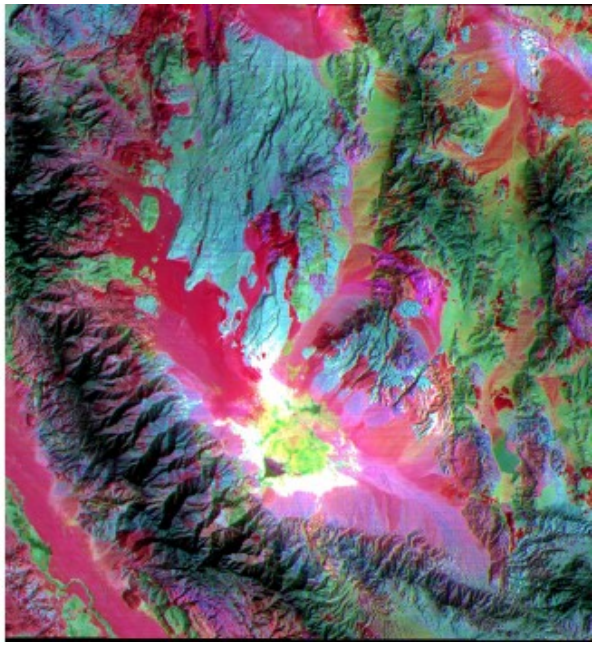

ASTER
Spectral Bands
Reflectance
1 2 3 4 5 6 7 8 9 10 11 12 13 14
0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 8.0 9.0 10.0 11.0 12.0 13.0
Landsat
Thematic Mapper
Spectral Bands
1 2 3 4 5 7 6
0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 8.0 9.0 10.0 11.0 12.0 13.0
Visible and Near Infrared
Short Wave Infrared
Thermal Infrared
Wavelength in micrometers
Short Wavelenghts
Long Wavelengths
Ultraviolet
(UV)
Visible Light
Infrared
(IR)
400 nanometers
500 nanometers
600 nanometers
700 nanometers



http://www.ece.rice.edu/~erzsebet/AVIRIS-TM-veg.html







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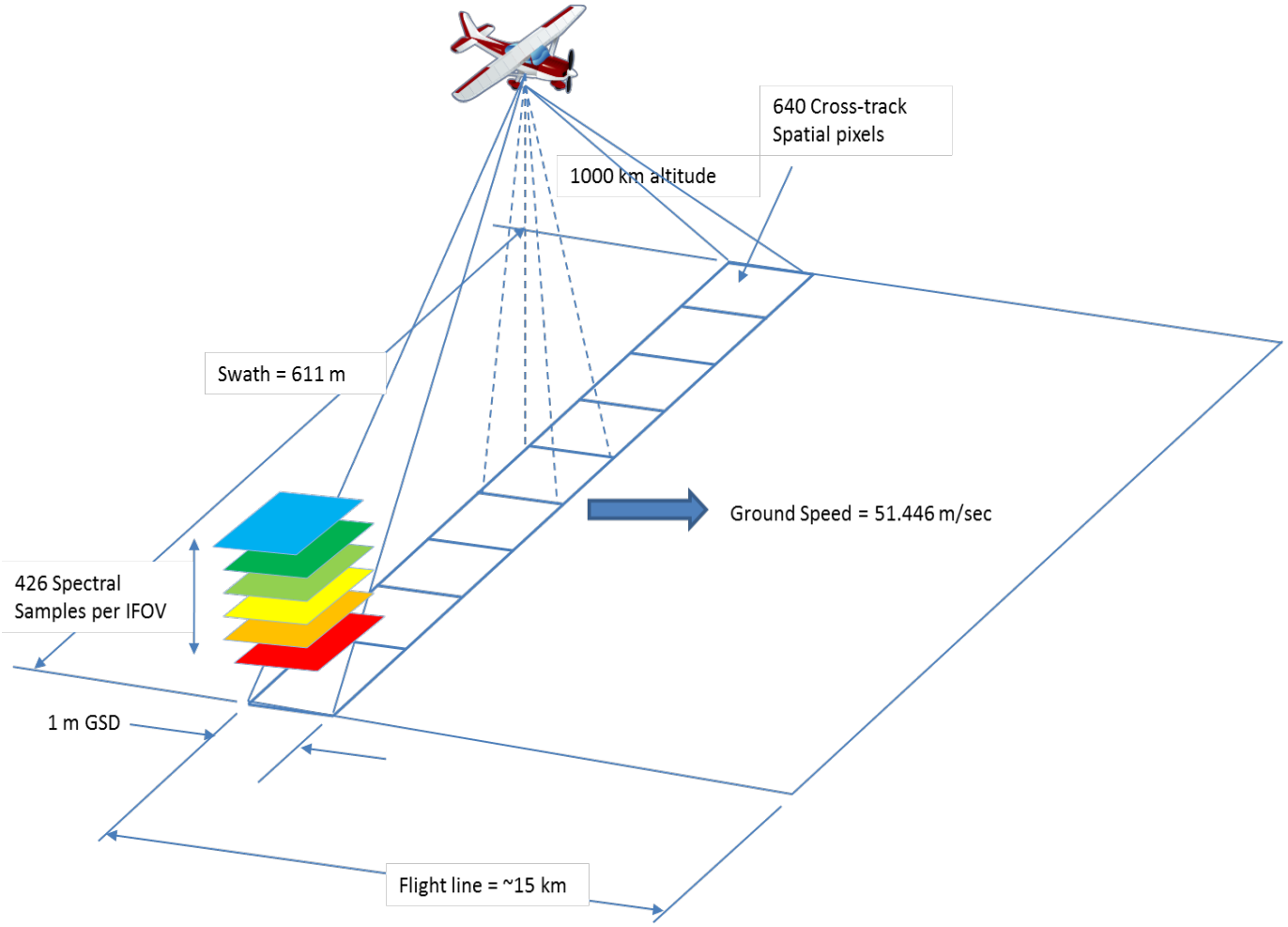
Sample AOP Higher-Level Data Products

Data Product	Description
Leaf water content	Upper canopy water content measured as equivalent water thickness
Leaf nitrogen content	Upper canopy nitrogen content
Pigment concentrations	Vegetation indices sensitive to concentrations of chlorophyll, xanthophylls, caroteniod and anthocyanin
fPAR: Fraction of photosynthetic active radiation	Measure of available radiation in specific wavelengths absorbed by canopy
Albedo	The fraction of total incident radiation striking a surface that is reflected by that surface
LAI: Leaf area index	Measure of green area per unit ground surface area
Cover fraction	Relative amounts of photosynthetic and non-photosynthetic vegetation, including bark, litter, branches, etc.
GPP: Gross primary production	Measure of the rate at which an ecosystem's producers capture and store a given amount of chemical energy as biomass in a given length of time
Canopy height (LiDAR)	Horizontal distribution of height profile of canopy components measured as the distance the canopy top and ground
Canopy structure (LiDAR)	Position, extent, quantity, volume, and shape of aboveground vegetation in both vertical and horizontal directions
Surface roughness (LiDAR)	Calculated as the standard deviation of the measured canopy heights

Hyperspectral Imaging



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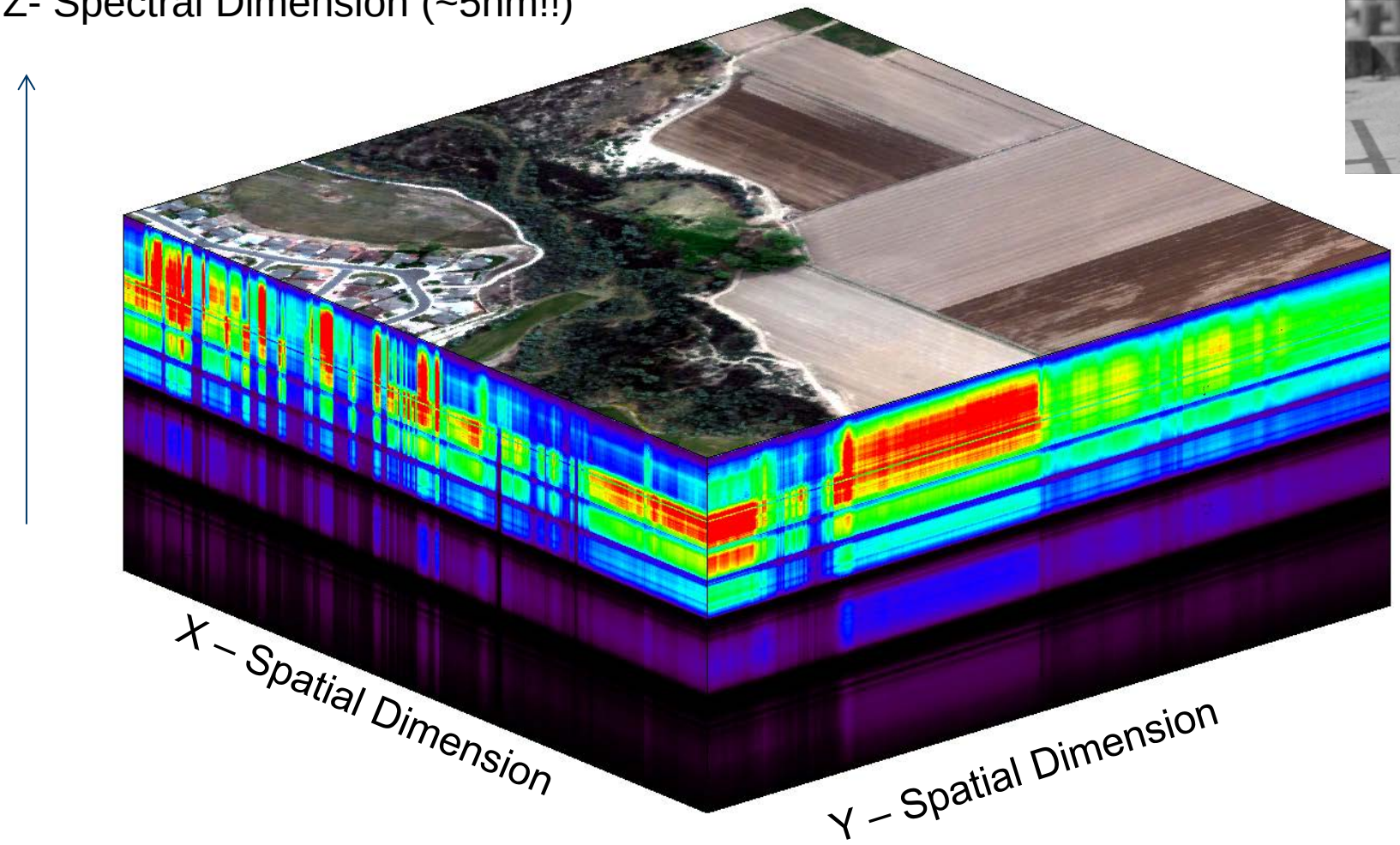
Z- Spectral Dimension (~5nm!!)



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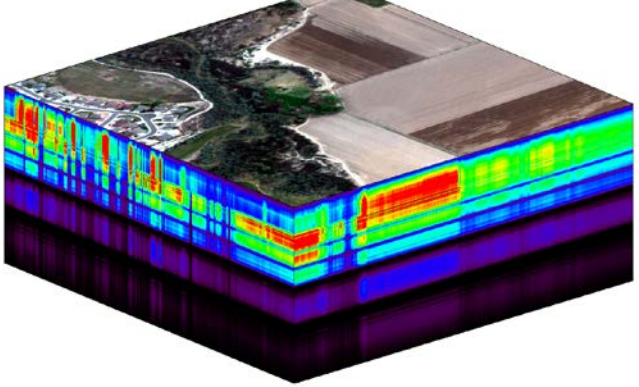

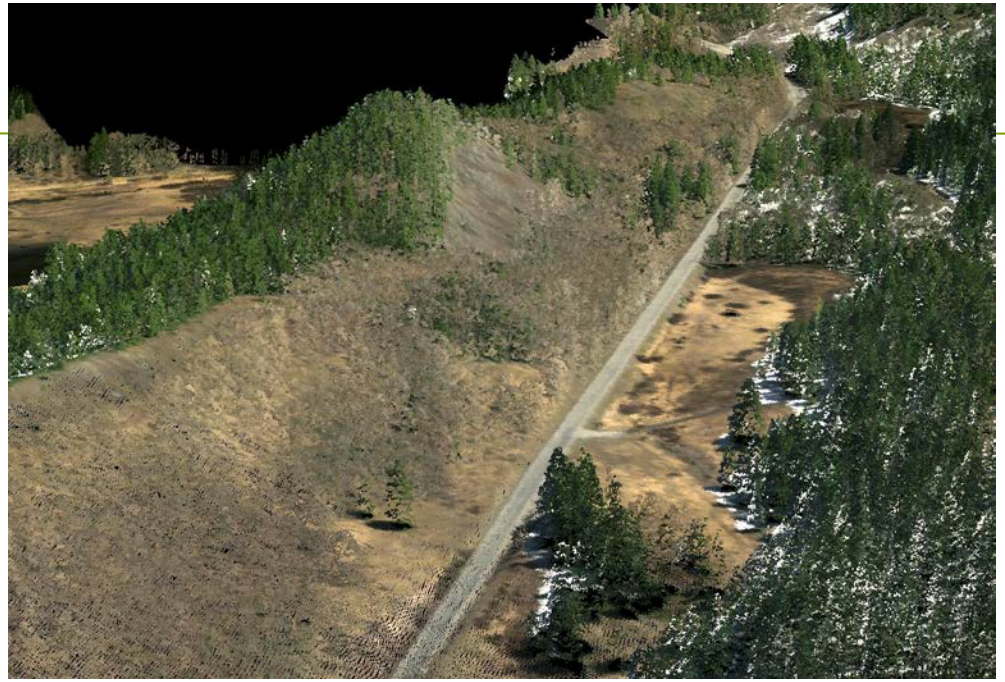

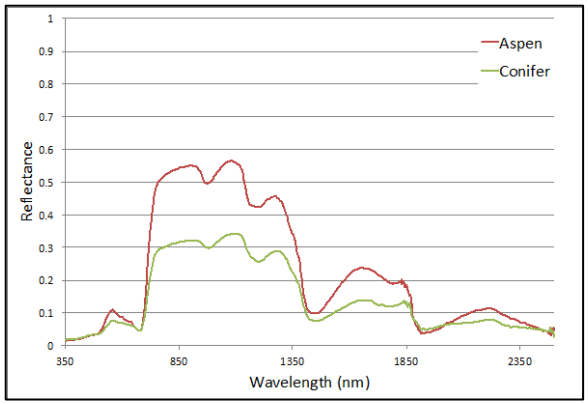

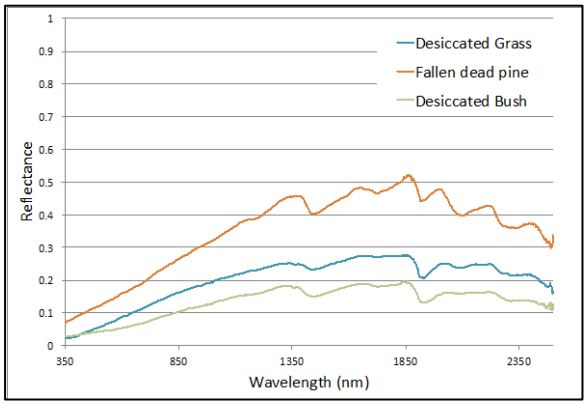

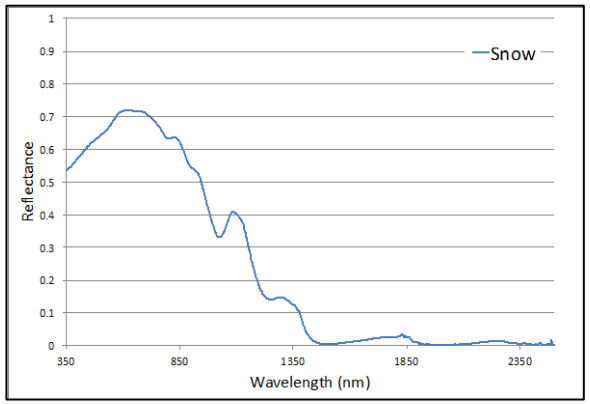

Aspen & Pine

Senescent Grass

Snow

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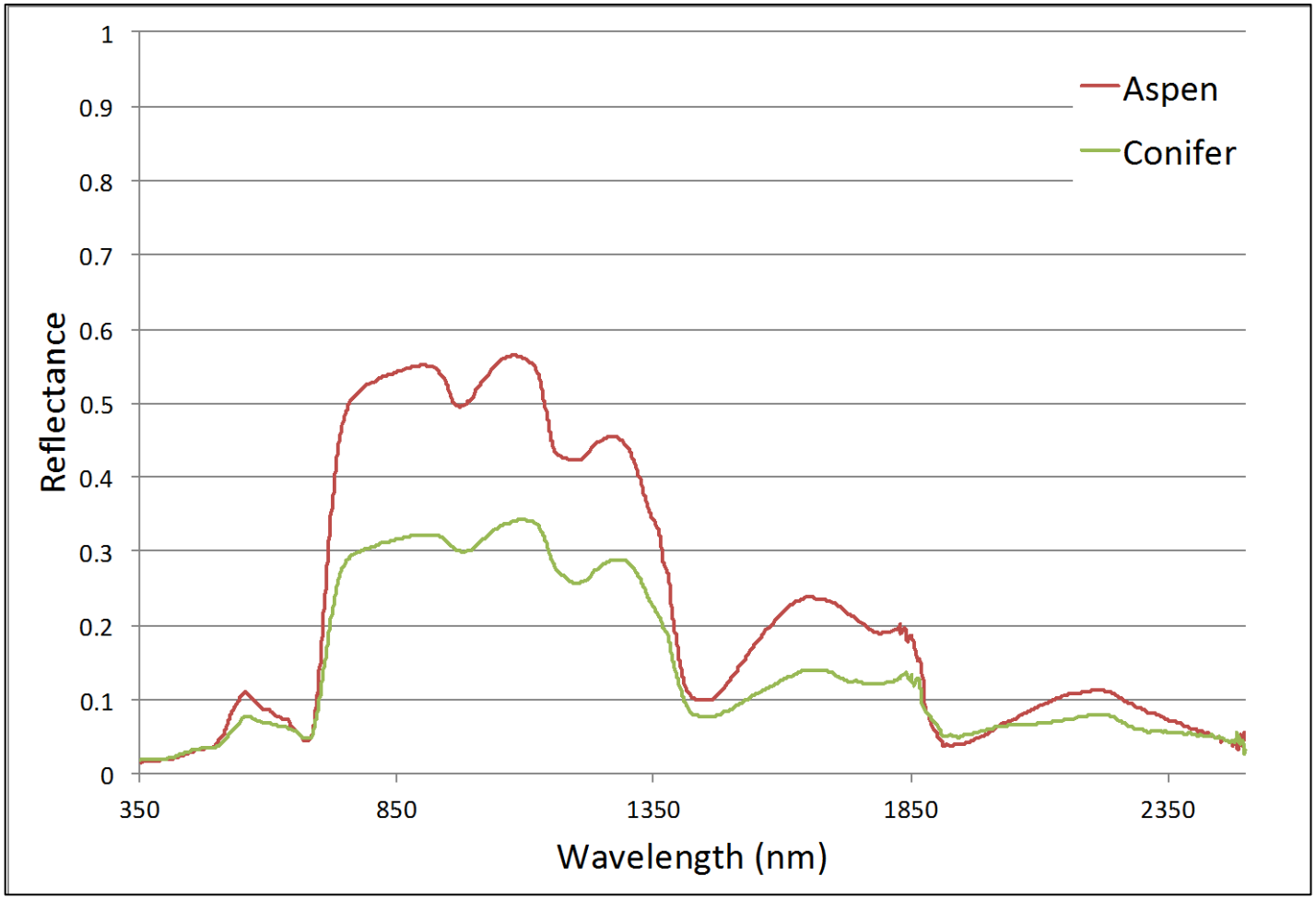

Aspen & Pine

Note: Vegetation is highly reflective in the Near Infrared portion of the spectrum

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Hierarchical Spectral Data

1. X,Y – individual pixels representing reflectance values for a band

2. Z – n dimensional array of matrices – each matrix in the array represents a band

- Key Attributes
  - Spatial Resolution (pixel size) – how much area on the ground does each pixel represent
  - Spectral resolution – how much of the electromagnetic spectrum does each band represent
  - Projection & Coordinate System Information

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LET'S CHECK OUT SOME DATA

Time to rock out -- Open Up the HDFViewer…

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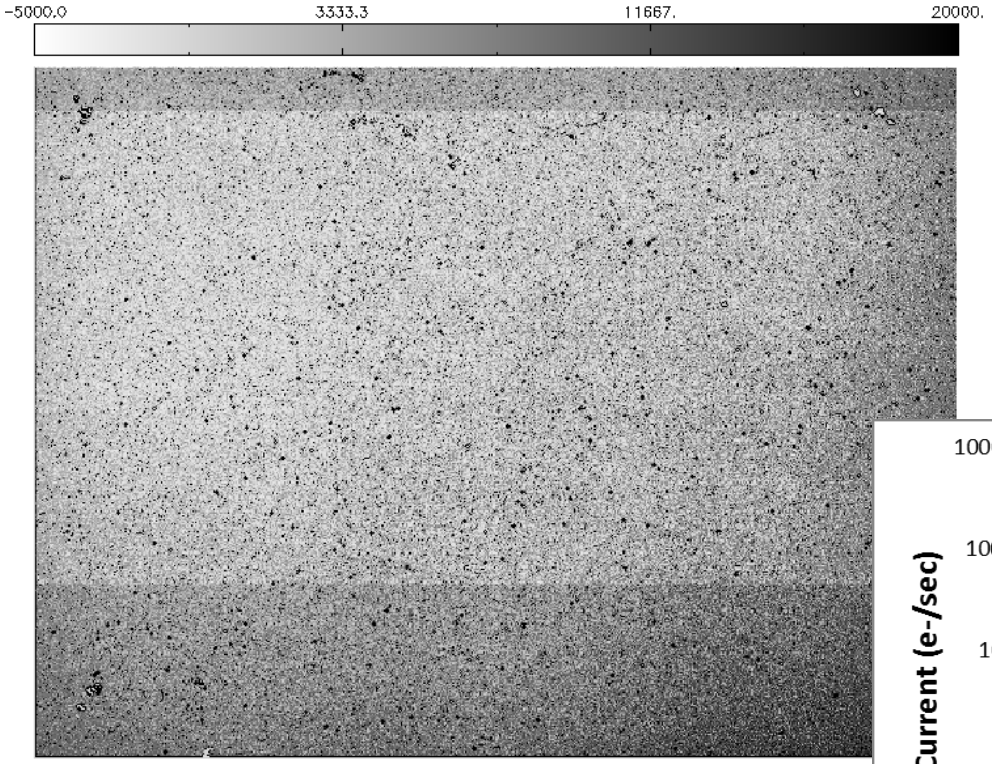
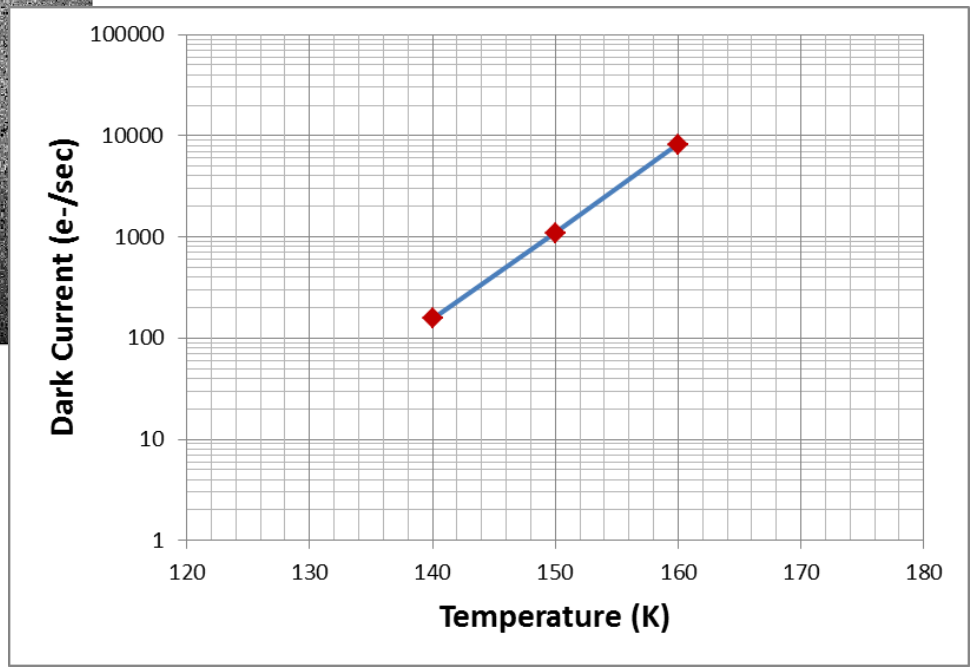
Why do We Cool the Spectrometer?



SCA Temp (K)	Median Dark Current (e-/sec)
140	156
150	1093
160	8231



- The principle sources of dark noise are temperature dependent and therefore dark current is reduced by cooling the FPA below ambient.
- Nominally, the FPA and the entire instrument is cooled to ~140 K during operation. The actual temperature dependence is device specific.

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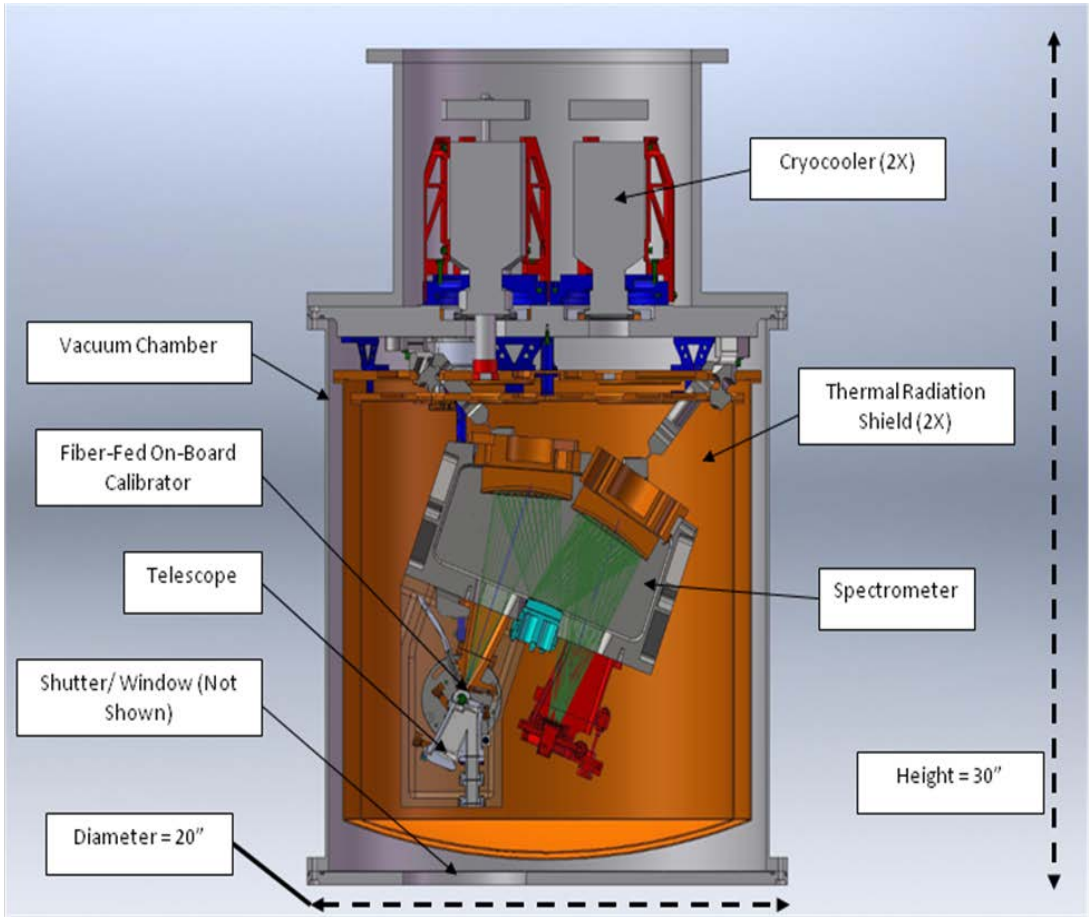
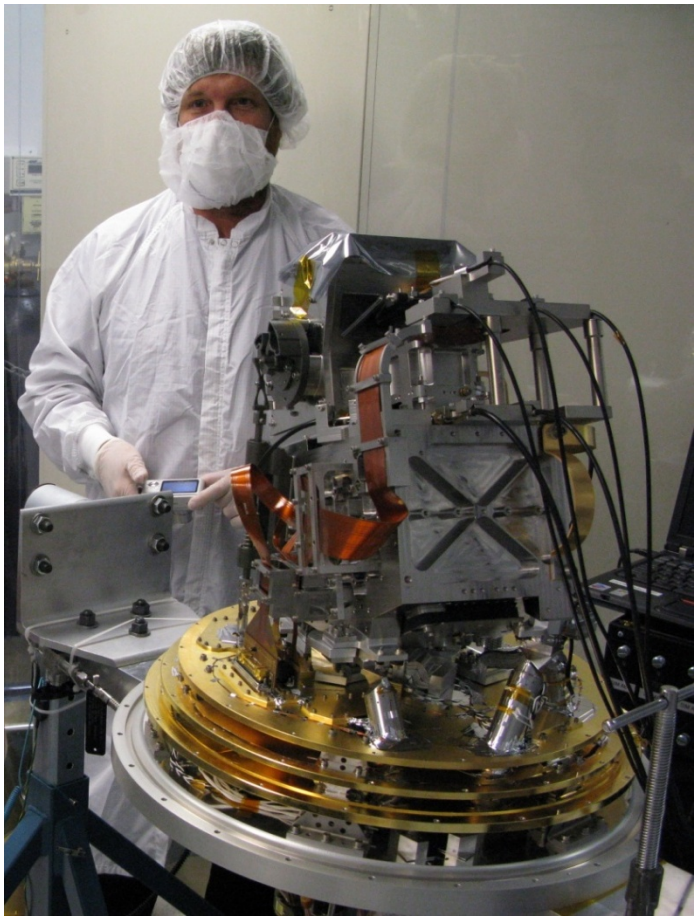
NEON Imaging Spectrometer





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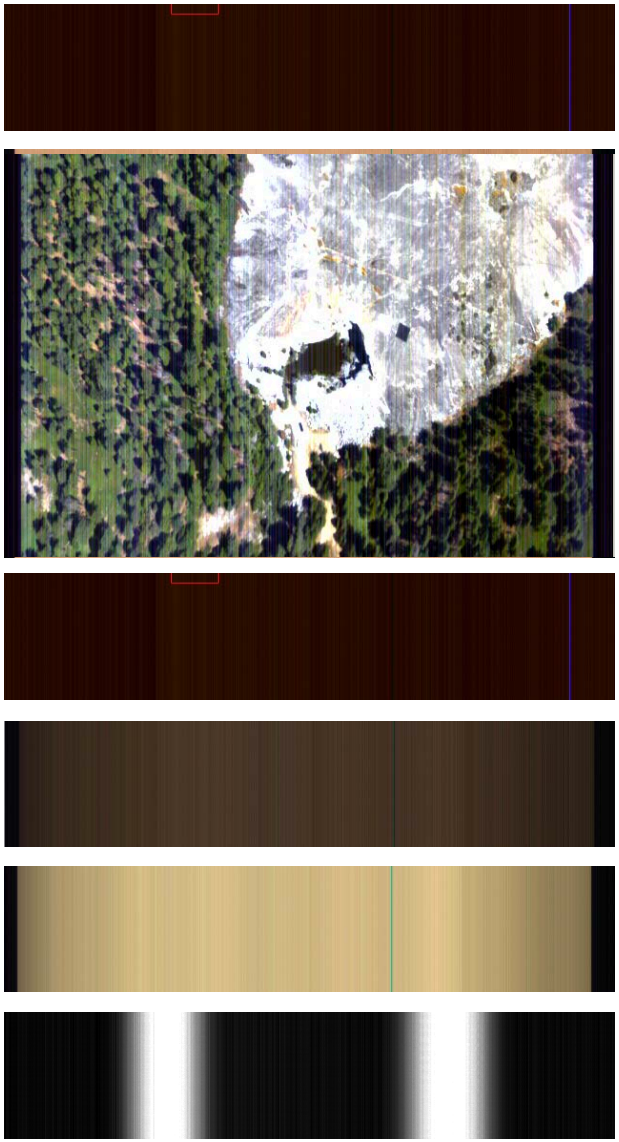
NIS Raw Flight Line Sequence



Dark Frame is taken prior to science collection

Science data is taken of the flight line target. In this case, Soaproot Saddle in NEON's Domain 17 collected in 2013. Reflectance tarps are visible in the uncorrected image

Dark Frame is taken after science collection

On-board calibrator (OBC) data is taken at a low light level immediately after second dark collect.

On-board calibrator (OBC) data is taken at a higher light level to improve signal at short wavelengths.

Laser data is taken to provide a spectral check and to conclude the sequence.

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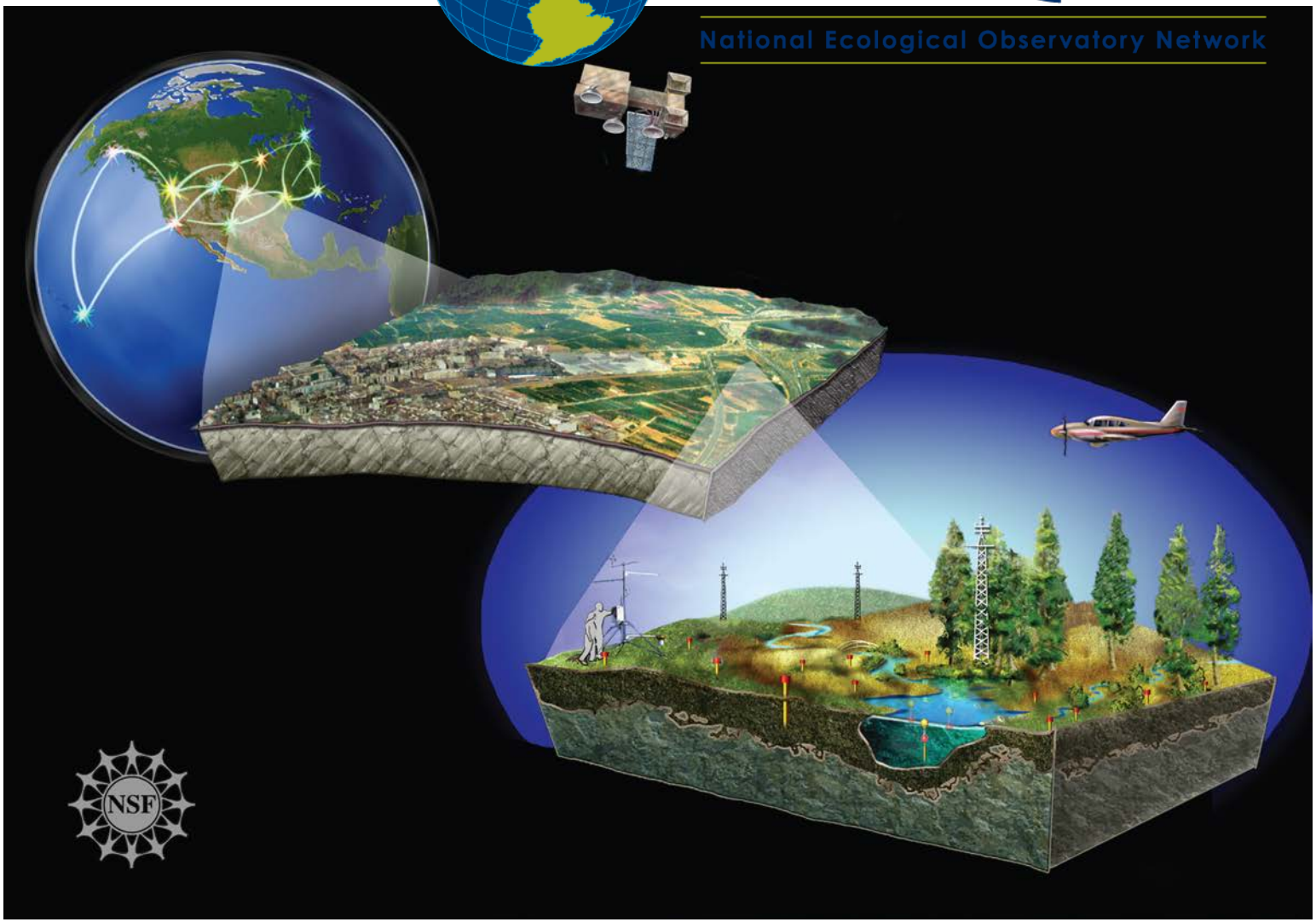

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