

## The EO-1 Mission: Hyperion data

Based on material prepared by

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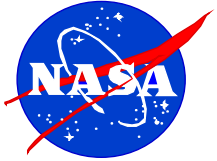
# Earth Orbiter - 1 Mission

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Three revolutionary land imaging instruments on EO-1 are collecting multispectral and hyperspectral scenes in coordination with Landsat-7. Detailed comparisons of the EO-1 and ETM+ images are being carried out to validate these instruments for follow-on missions.

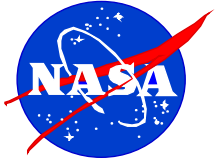
The mission is a combination of technology demonstrations and application validations





# EO-1 Instrument Overviews

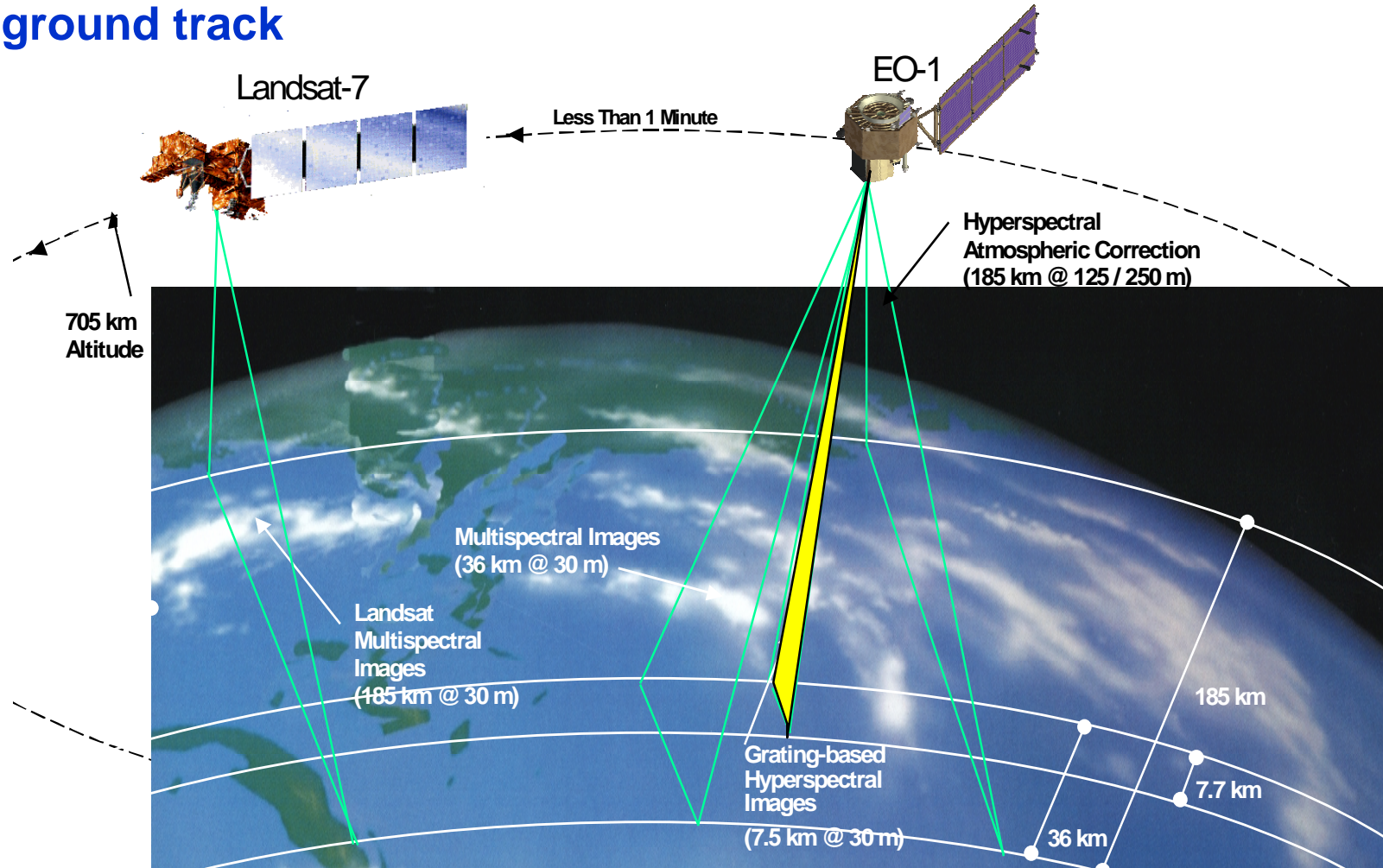
Parameters	EO-1		
	ALI	HYPERION	AC
Spectral Range	0.4 - 2.4 $\mu\text{m}$	0.4 - 2.4 $\mu\text{m}$	0.9 - 1.6 $\mu\text{m}$
Spatial Resolution	30 m	30 m	250 m
Swath Width	36 Km	7.6 Km	185 Km
Spectral Resolution	Variable	10 nm	6 nm
Spectral Coverage	Discrete	Continuous	Continuous
Pan Band Resolution	10 m	N/A	N/A
Total Number of Bands	10	220	256



# EO-1 Orbit



EO-1 orbit is one minute behind Landsat-7 covering the same ground track



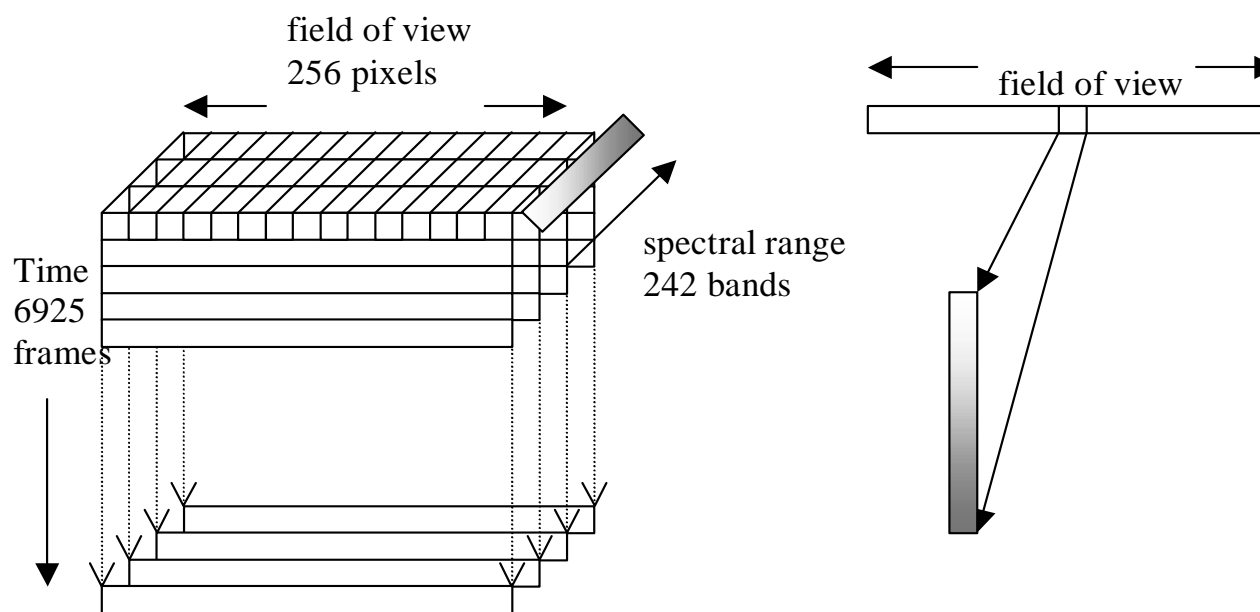


# Hyperion Data Cube

*Pushbroom configuration, entire swath width collected each frame sampled every 4.5 ms, or 223.4 frames/second.*

*Common fore-optics, dichroic filter reflects 400 nm to 1000 nm to the VNIR and transmits 900 nm to 2500 nm to the SWIR.*

*Gratings disperse light onto two focal planes*

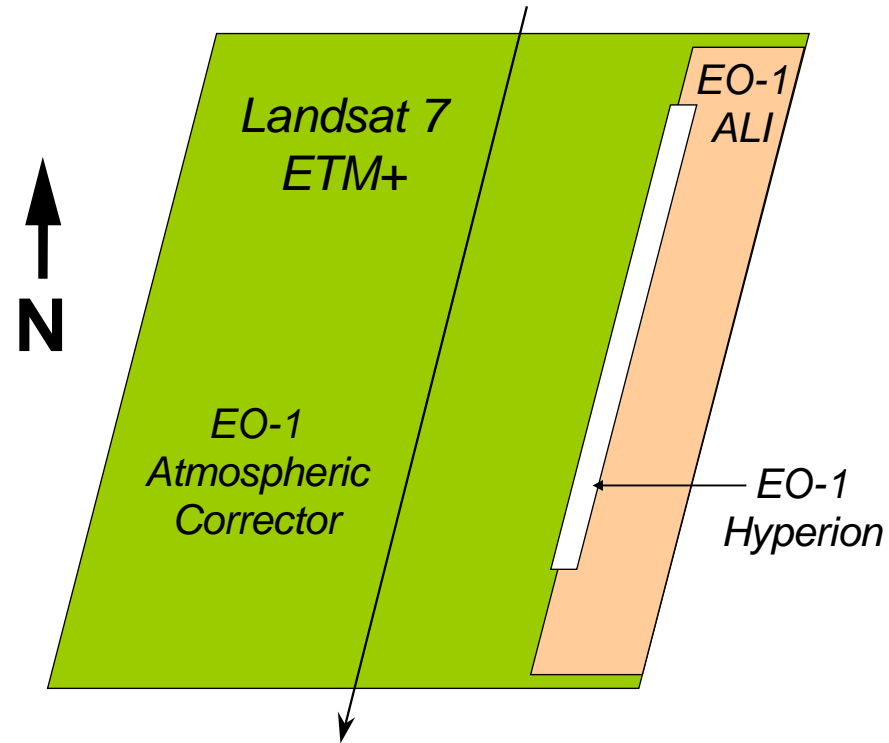


- *Produces a three dimensional data cube 256x6925x242 in 30 seconds!*

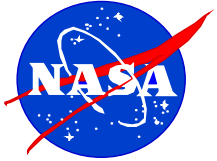


# EO-1 Sensor Swaths

Hyperion Swath Width: 7.6 km



**NADIR Pointing**



# Hyperion Image - Argentina

Hyperspectral Image Acquired Dec 1, 2000 (day 336)

Color image produced using 3 bands in the VNIR

Blue = band 14 (488 nm)

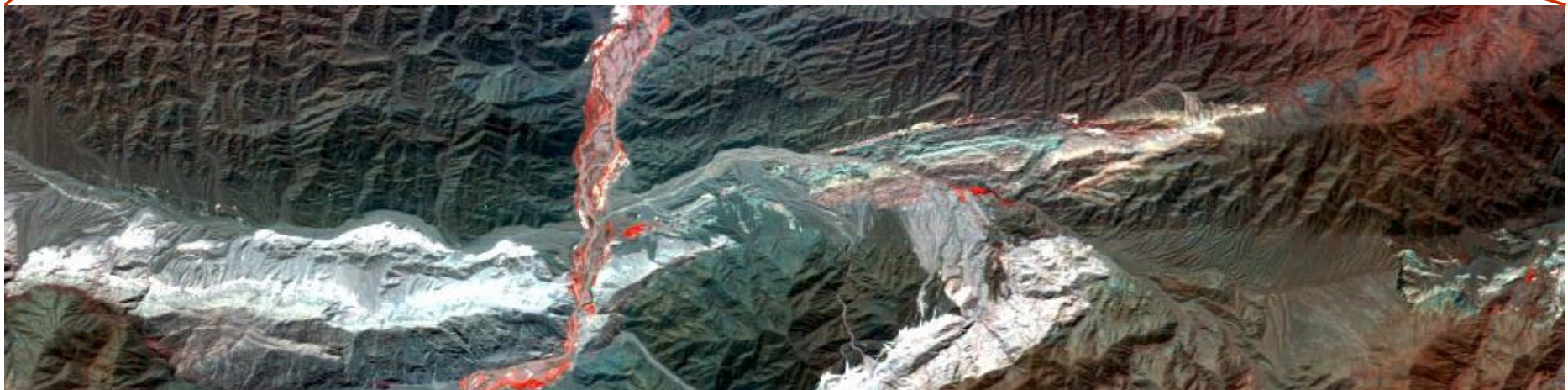
Green = band 20 (549 nm)

Red = band 38 (731 nm) (red shows areas of new spring growth)



Approx. 7.6 km wide x 65 km long

← NORTH

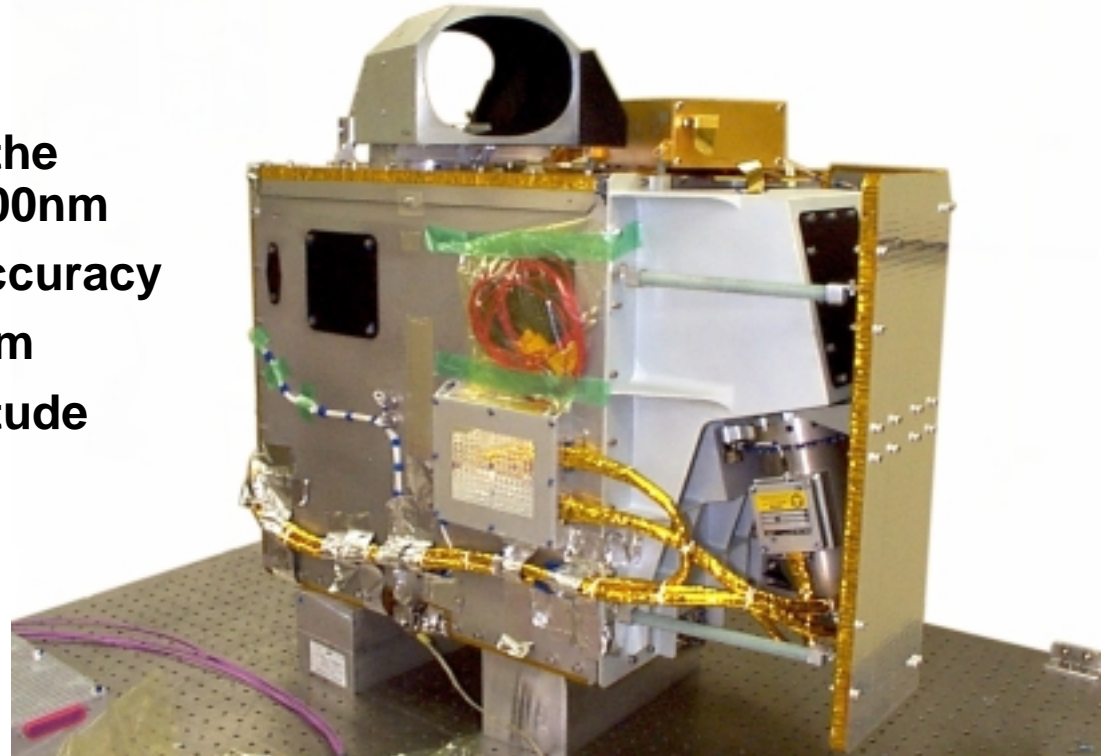




# Hyperion Hyperspectral Imager

*The Hyperion is a push-broom imager with:*

- 220 10nm bands covering the spectrum from 400nm - 2400nm
- 6% absolute radiometric accuracy
- Image swath width of 7.6 km
- GSD of 30 m at 705 km altitude
- 16 day cycle orbit
- 12-bit image data
- On year Life (2 year Goal)





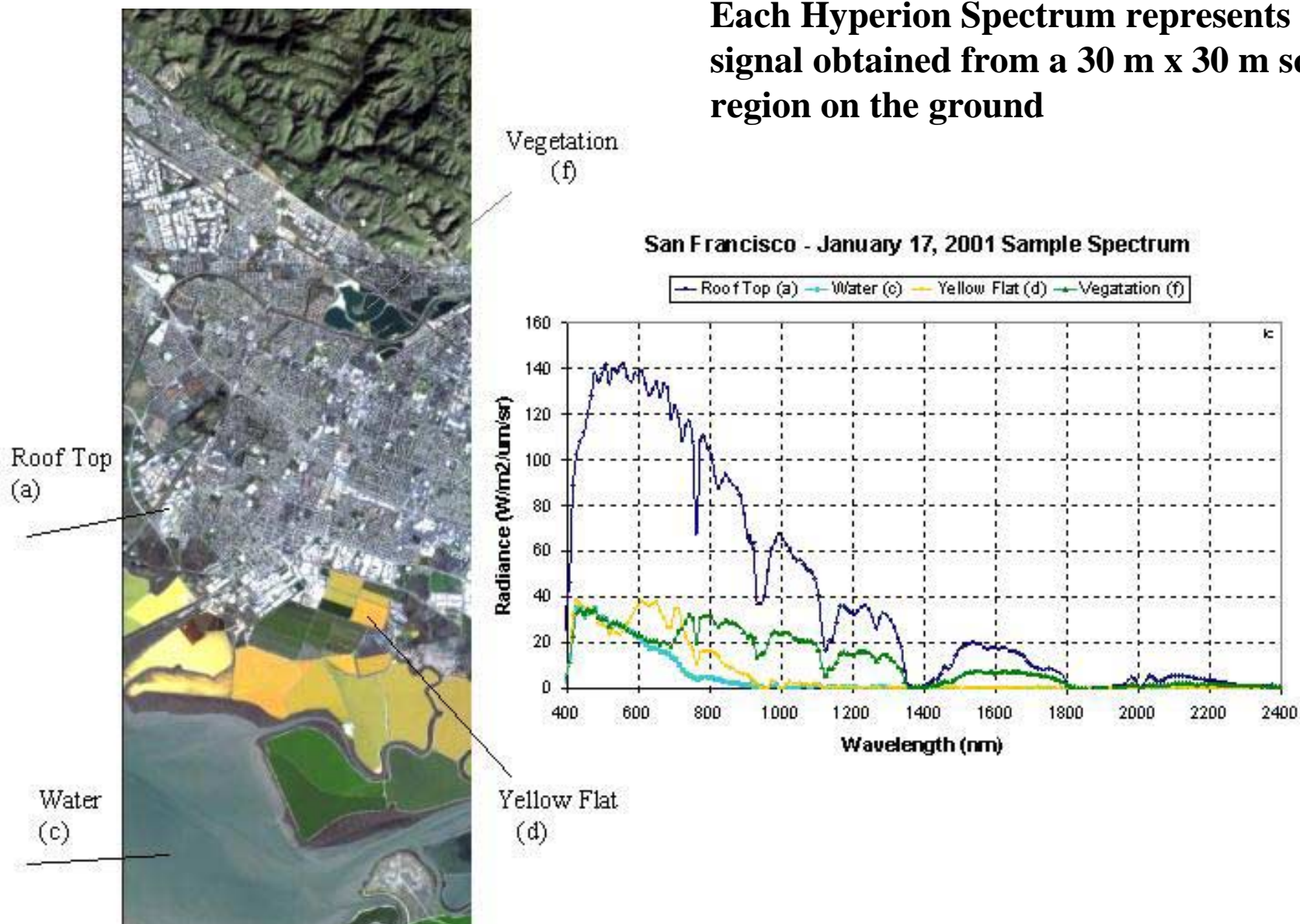


# Hyperion Characteristics

<u>Parameter</u>	<u>Hyperion</u>
Volume (L x W x H, cm)	39 x 75 x 66
Weight (Kg)	49
Average Power (W)	51
Aperture (CM)	12
IFOV (mrad)	0.043
Crosstrack FOV (deg)	0.63
Wavelength Range (L1 data) (nm)	400 – 2400
Spectral Resolution (nm)	10
Number of Spectral Bands	220
Digitization (bits)	12
Frame Rate (Hz)	225

# Samples of of Hyperion Spectra

Each Hyperion Spectrum represents the signal obtained from a 30 m x 30 m square region on the ground

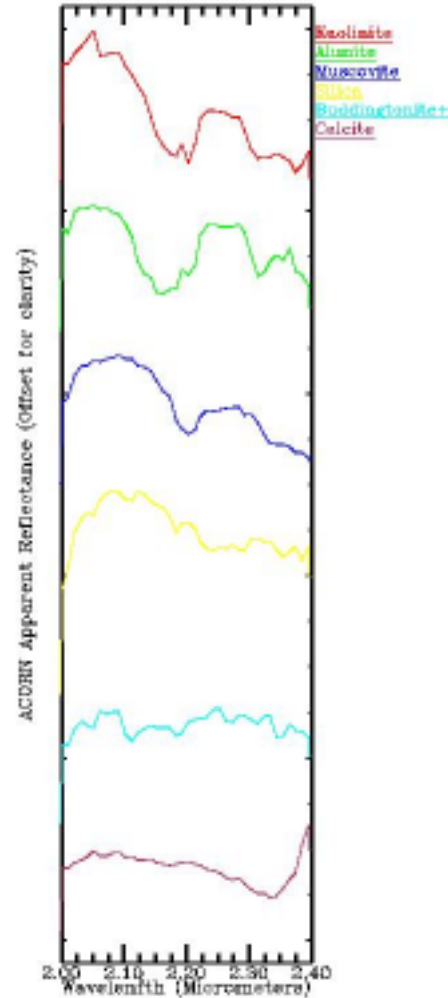




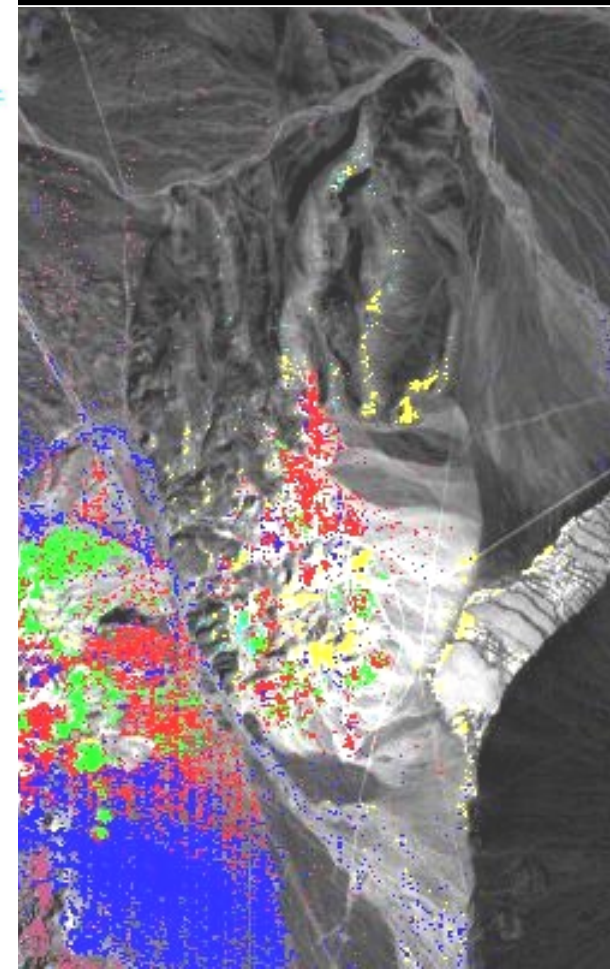
# Cuprite – A Mineral Analysis



**Hyperion True  
Color Image**

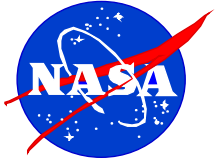


**Hyperion SWIR  
Endmember Spectra**



**Hyperion SWIR  
Mineral Map**

Courtesy of Fred Kruse AIGLIC



# Mt. Etna Sample Spectra



Hyperion Spectra of Mt Etna Scene July 13th 2001

