DISR Science Team

- M. G. Tomasko, L. R. Doose, B. Rizk, P. Smith--University of Arizona
- R. West—Jet Propulsion Laboratory
- L. Soderblom—U.S.G.S.
- B. Bezard, A. Coustenis, E. Lellouch, C. deBergh, M. Combes--Paris Observatory
- Bernard Schmitt—Institute for Glaciology, Grenoble, France
- U. Keller—Max Planck Institute for Aeronomy, Lindau, Germany
- F. Gliem—Technical Institute of Braunschweig, Germany
- N. Thomas—University of Bern, Switzerland

DISR Science Objectives

Thermal Balance and Dynamics

- **>Solar deposition profile**
- **>Radiative cooling profile and net radiative dynamical forcing**
- **>Observed wind direction, speed vs. altitude**

Aerosols and Clouds

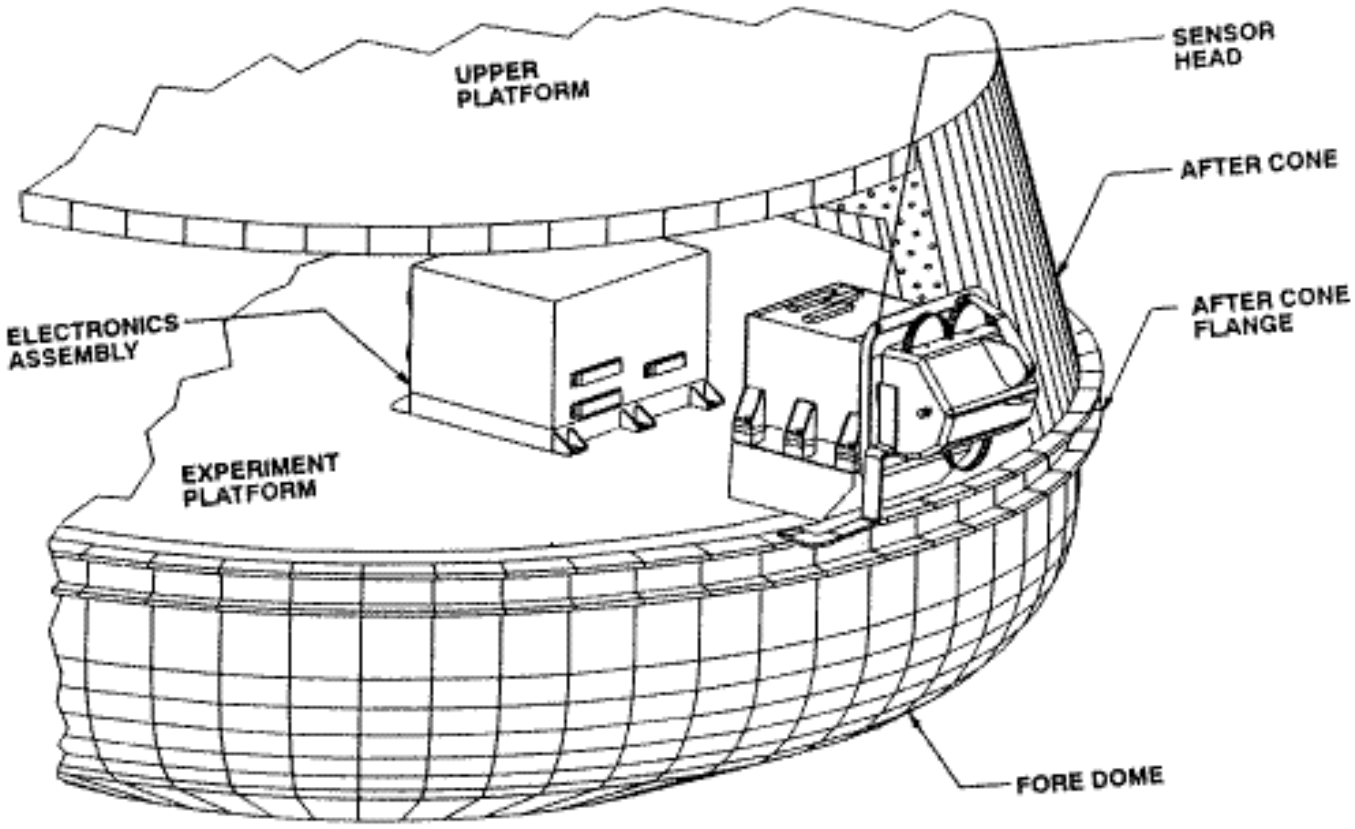
- **>Optical properties, particle size, shape, number vs. altitude**
- **>Morphology, extent of condensation clouds**
- **>Altitude, optical depth of any thin layers seen on the horizon**

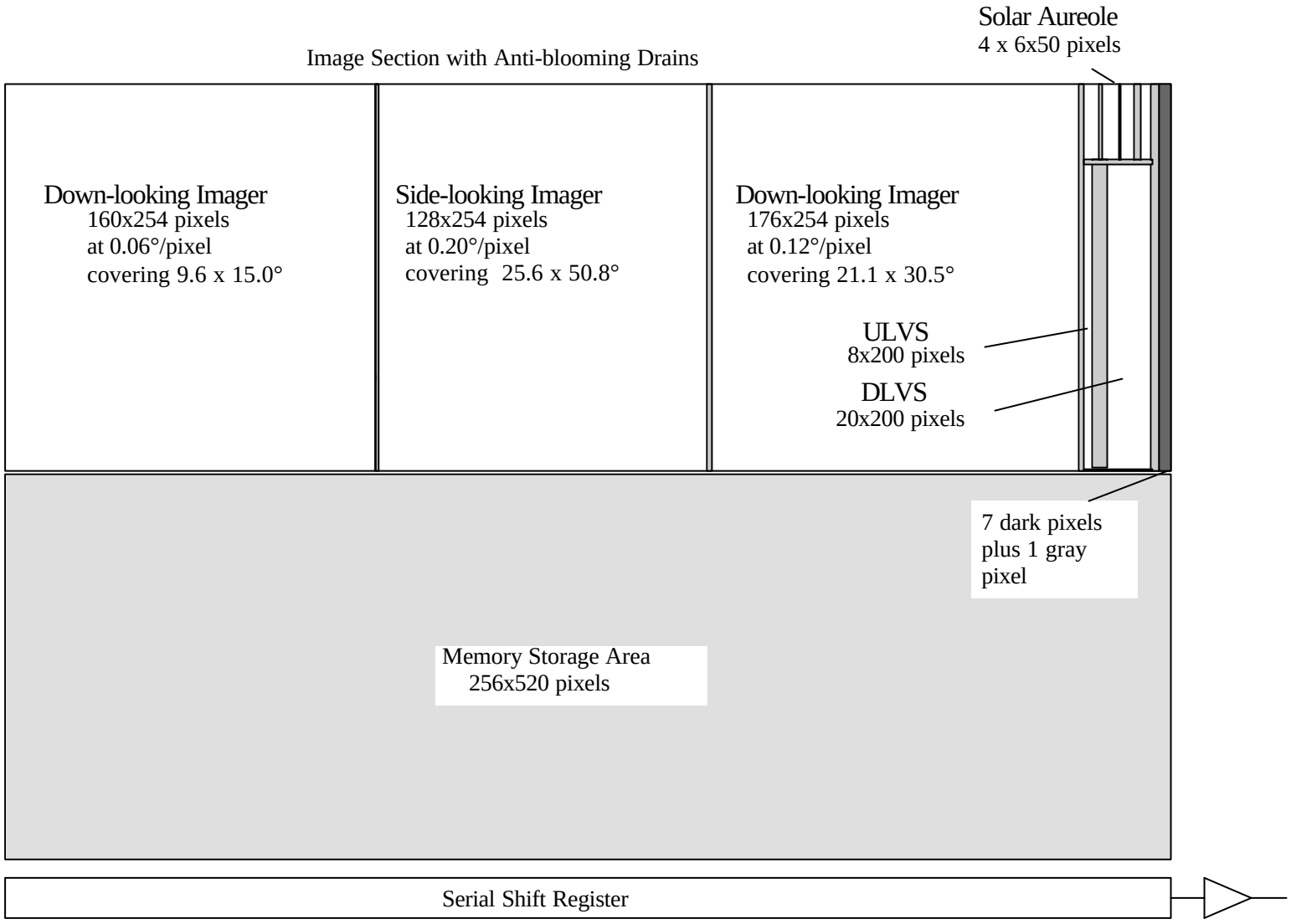
Atmospheric Composition

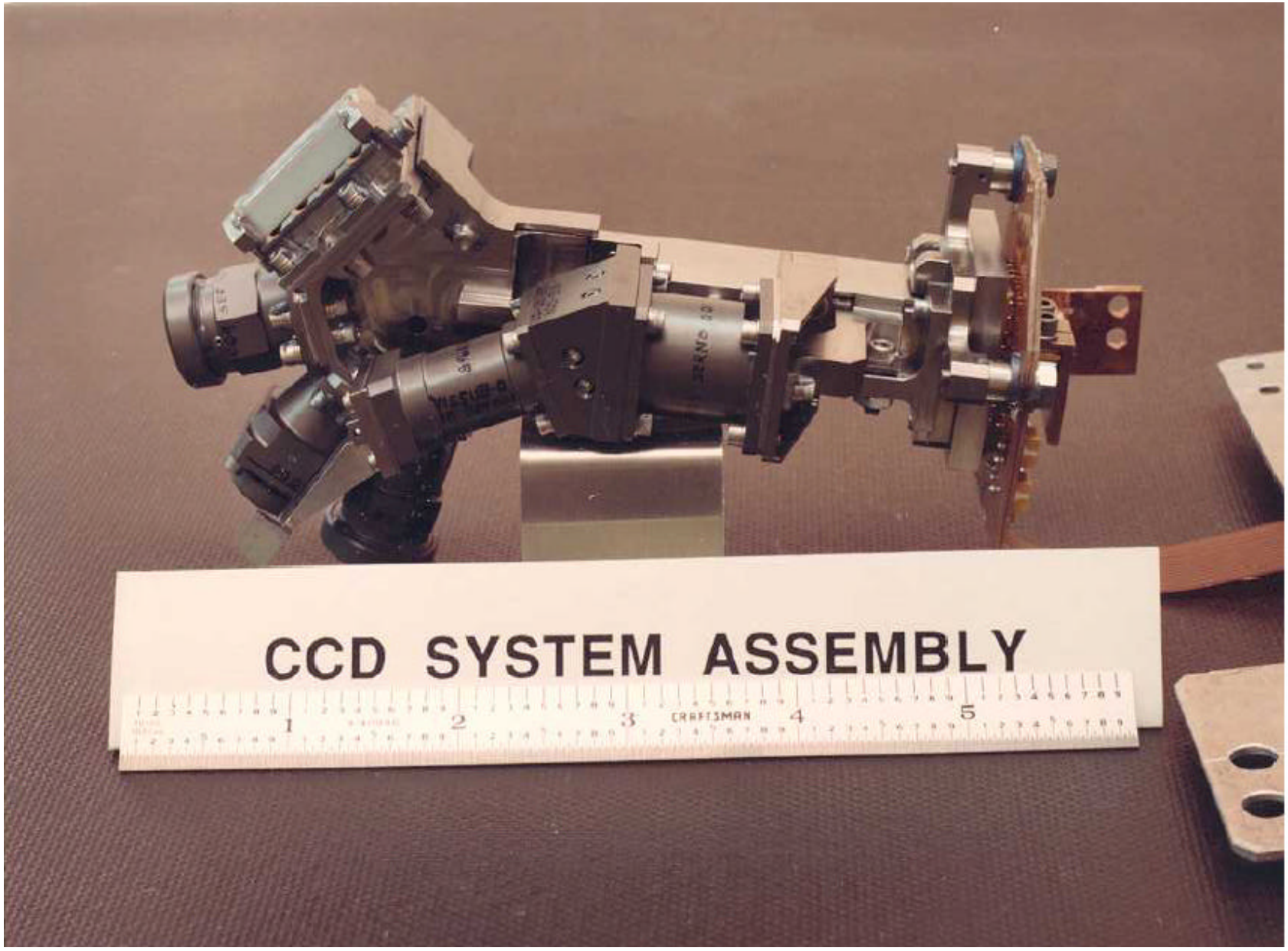
- **>Methane mixing profile**
- **>Argon mixing ratio**
- **>Possibly other absorbing gases**

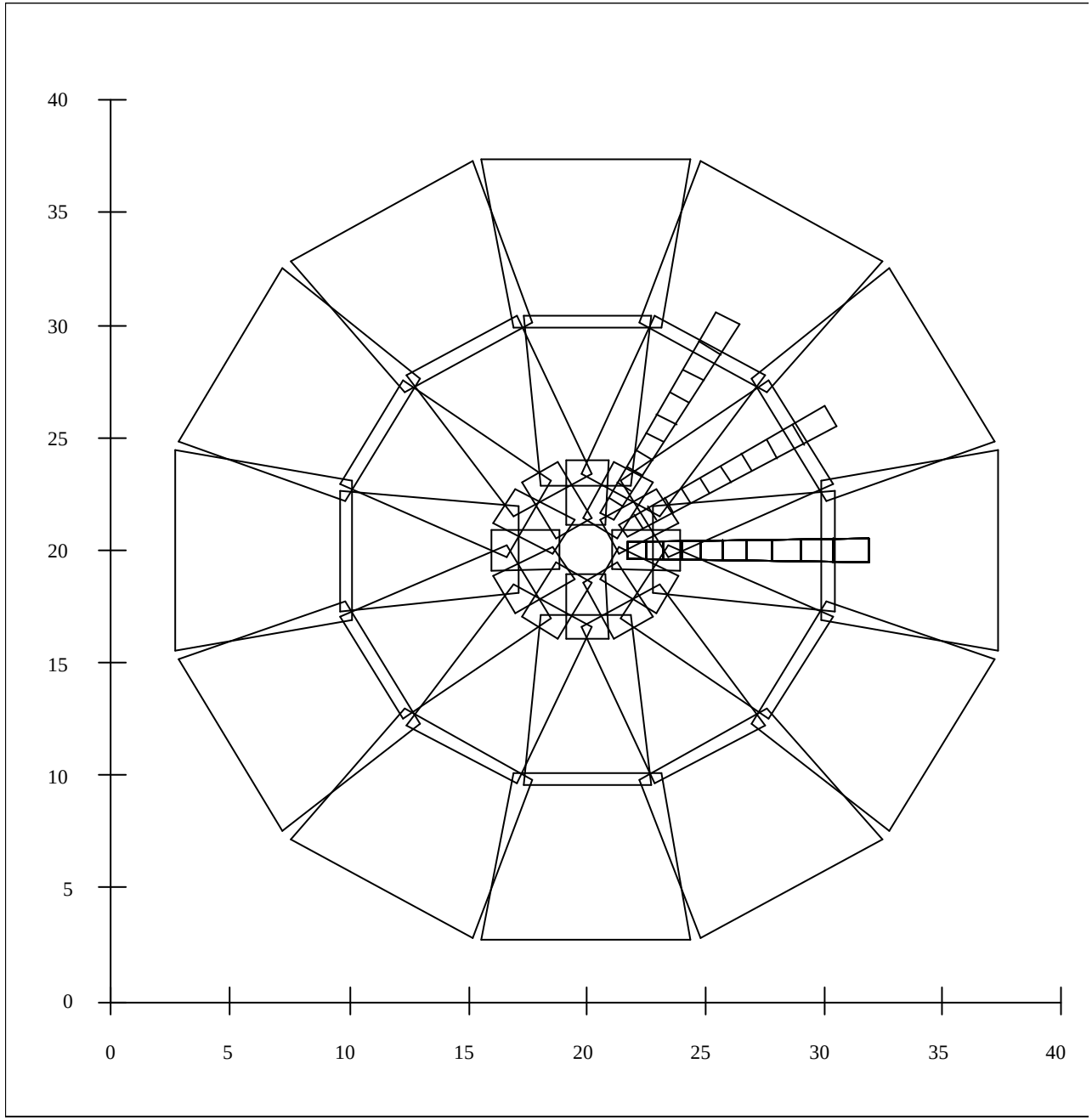
Nature of Surface

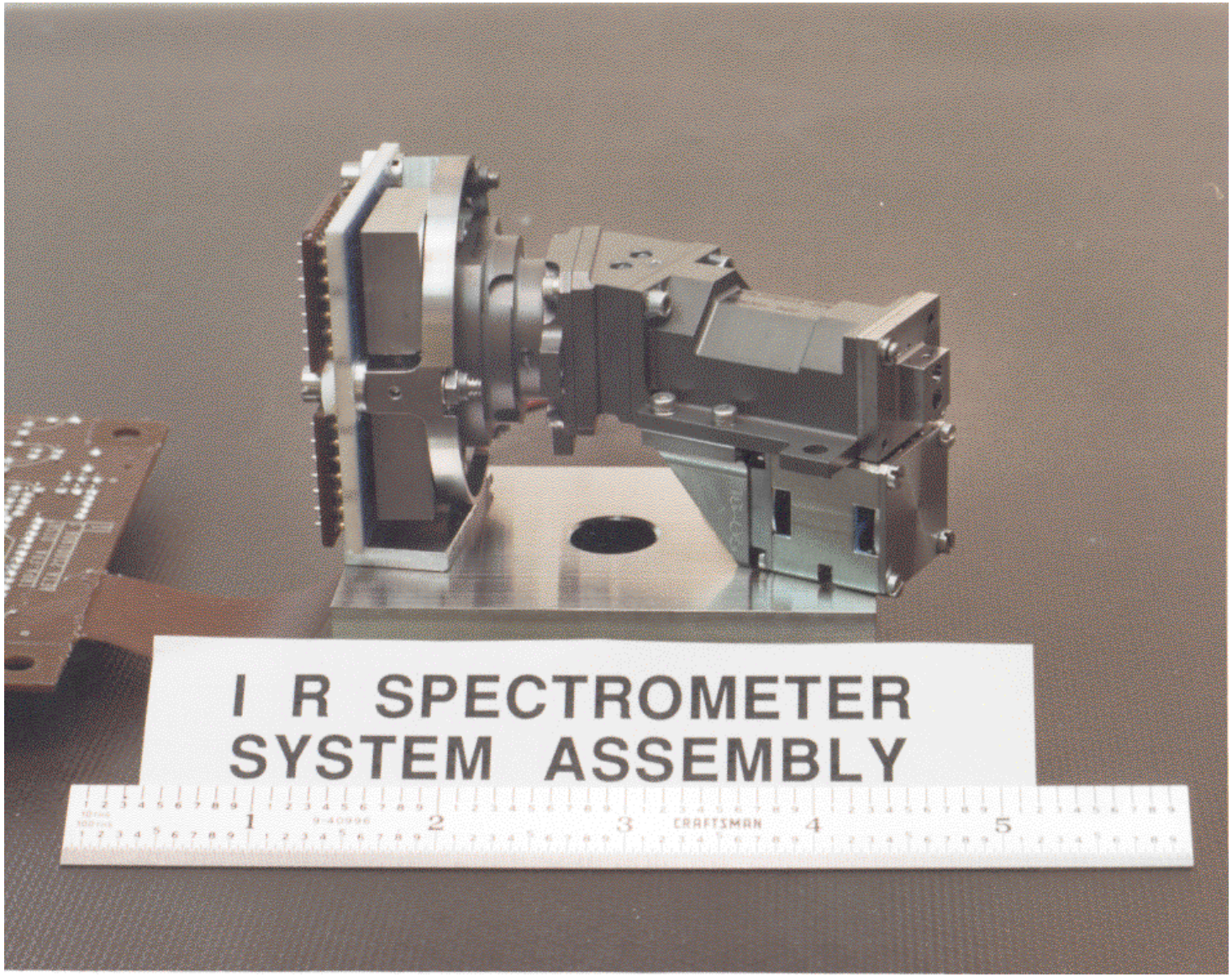
- **>Physical state**
- **>Topography**
- **>Composition**

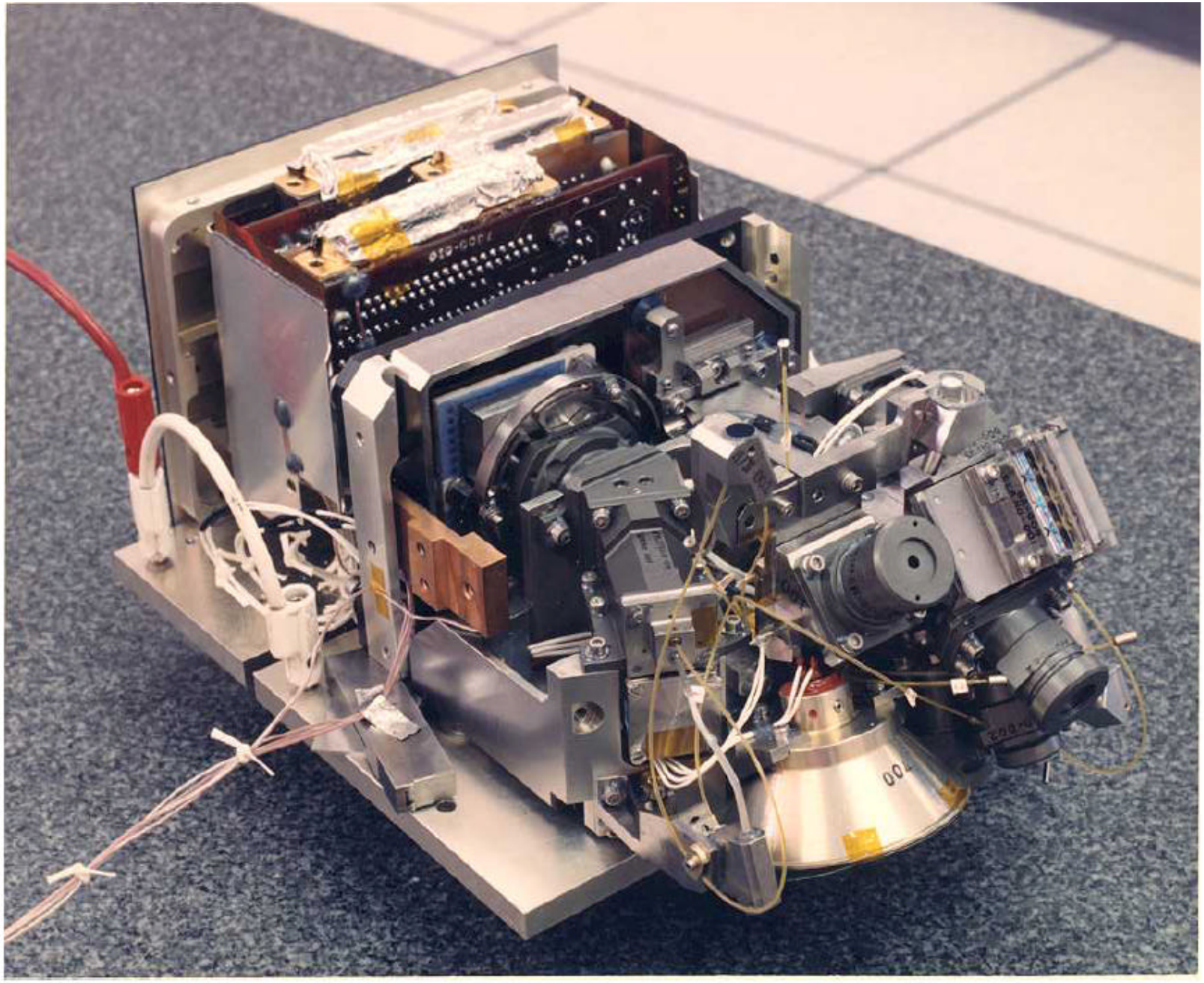

UPPER
PLATFORM
SENSOR
HEAD
AFTER CONE
ELECTRONICS
ASSEMBLY
AFTER CONE
FLANGE
EXPERIMENT
PLATFORM
FORE DOME

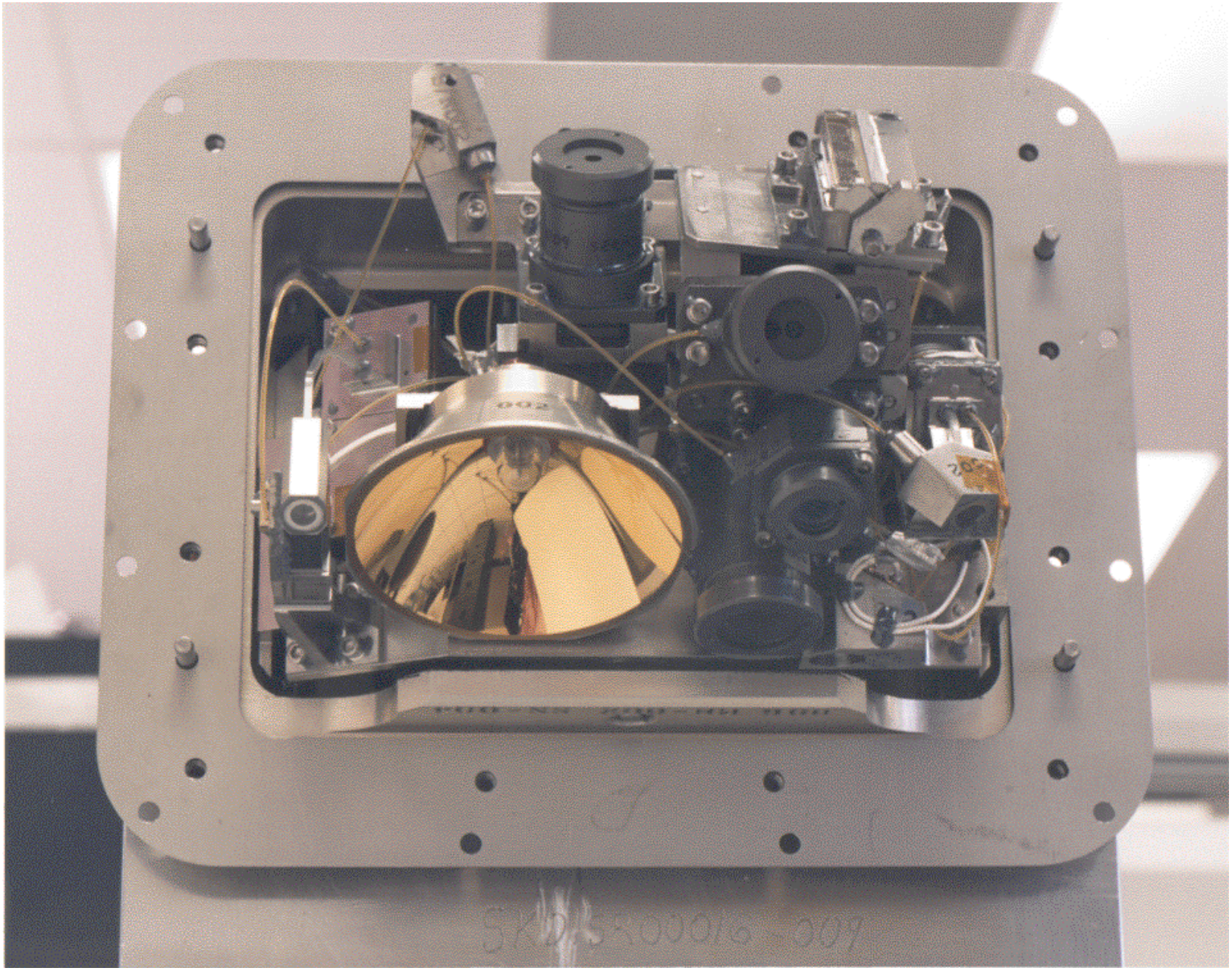

Solar Aureole
4 x 6x50 pixels
Image Section with Anti-blooming Drains
Down-looking Imager
160x254 pixels
at 0.06°/pixel
covering 9.6 x 15.0°
Side-looking Imager
128x254 pixels
at 0.20°/pixel
covering 25.6 x 50.8°
Down-looking Imager
176x254 pixels
at 0.12°/pixel
covering 21.1 x 30.5°
ULVS
8x200 pixels
DLVS
20x200 pixels
7 dark pixels
plus 1 gray
pixel
Memory Storage Area
256x520 pixels
Serial Shift Register

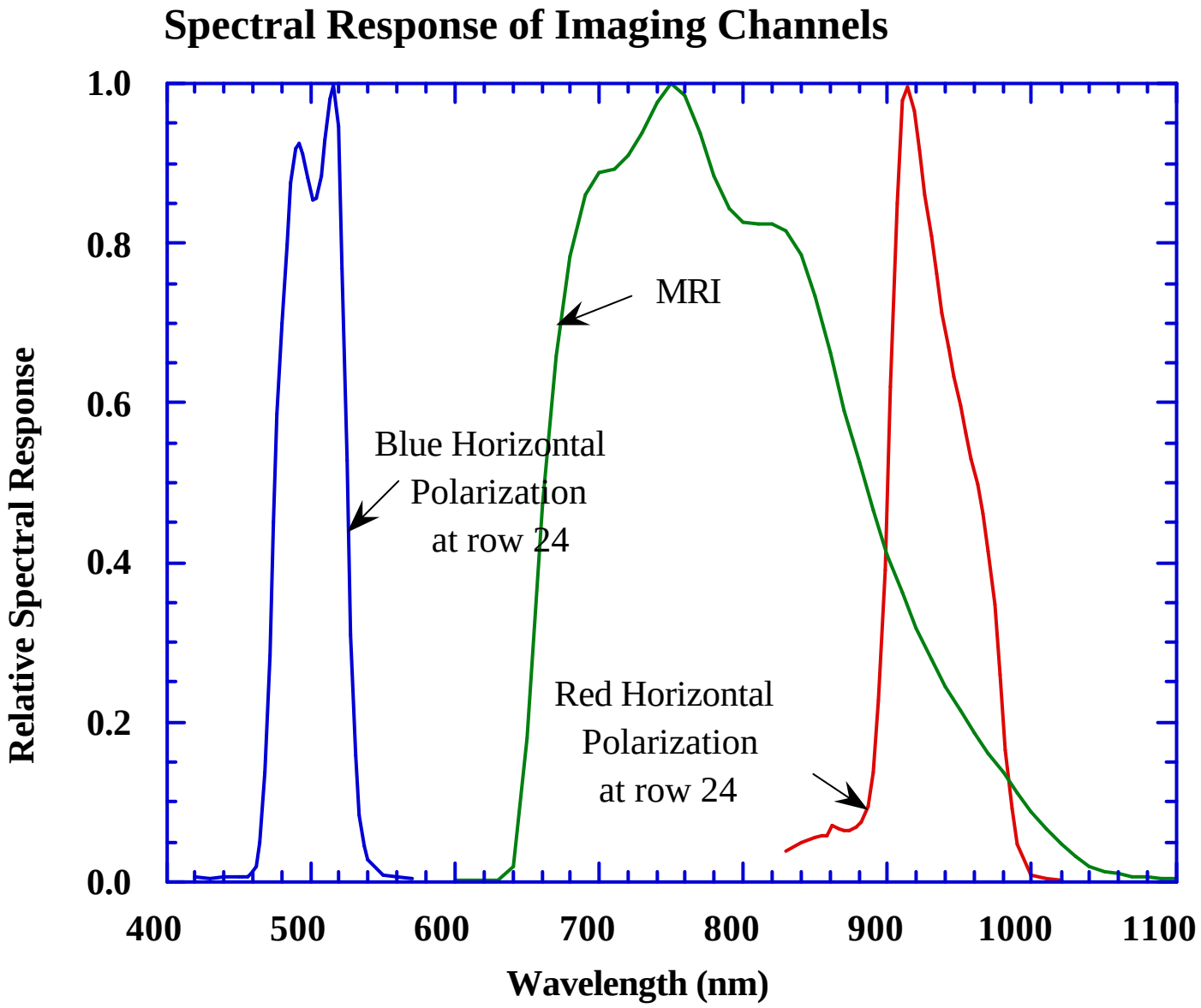

CCD SYSTEM ASSEMBLY
CRAFTSMAN

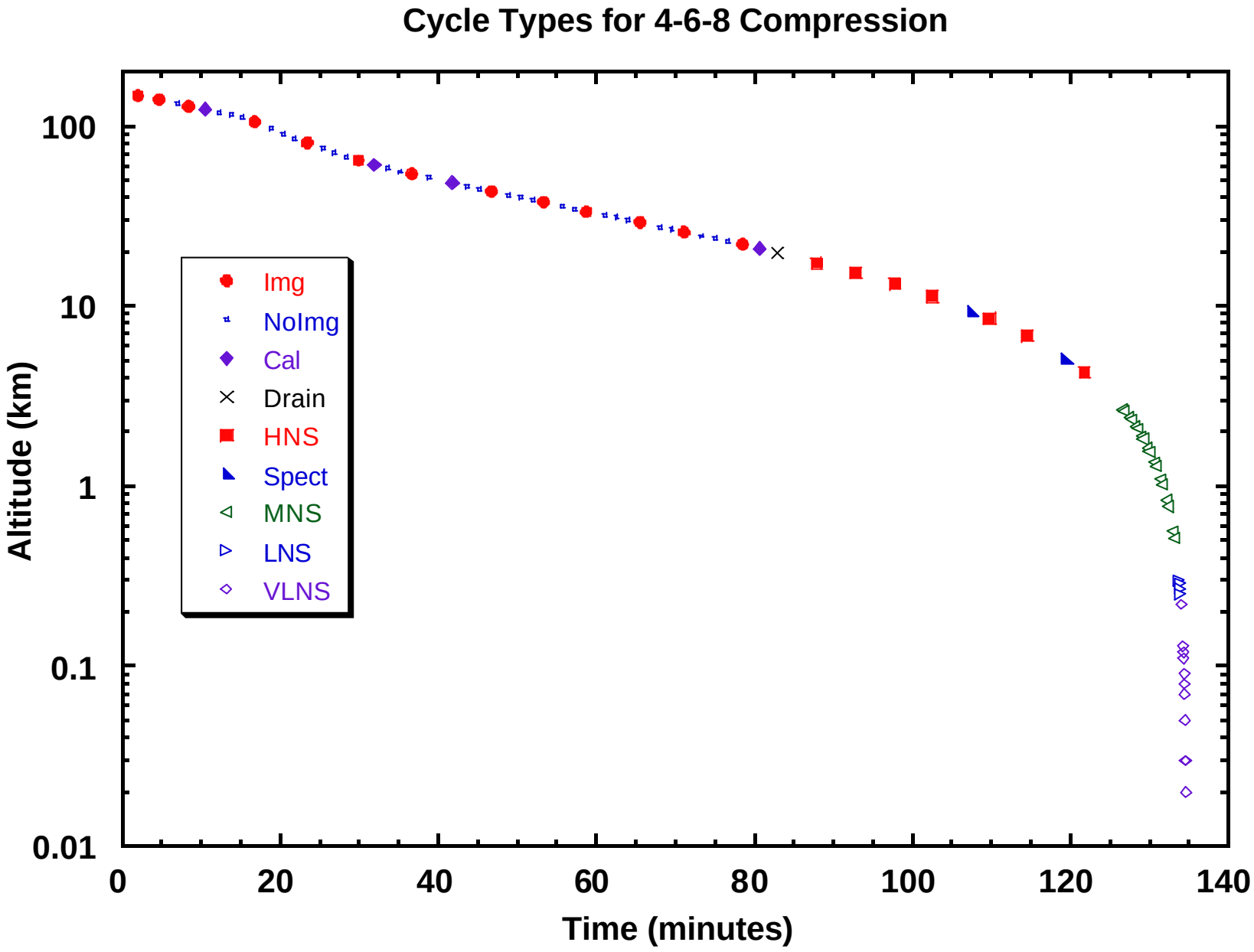

40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
40

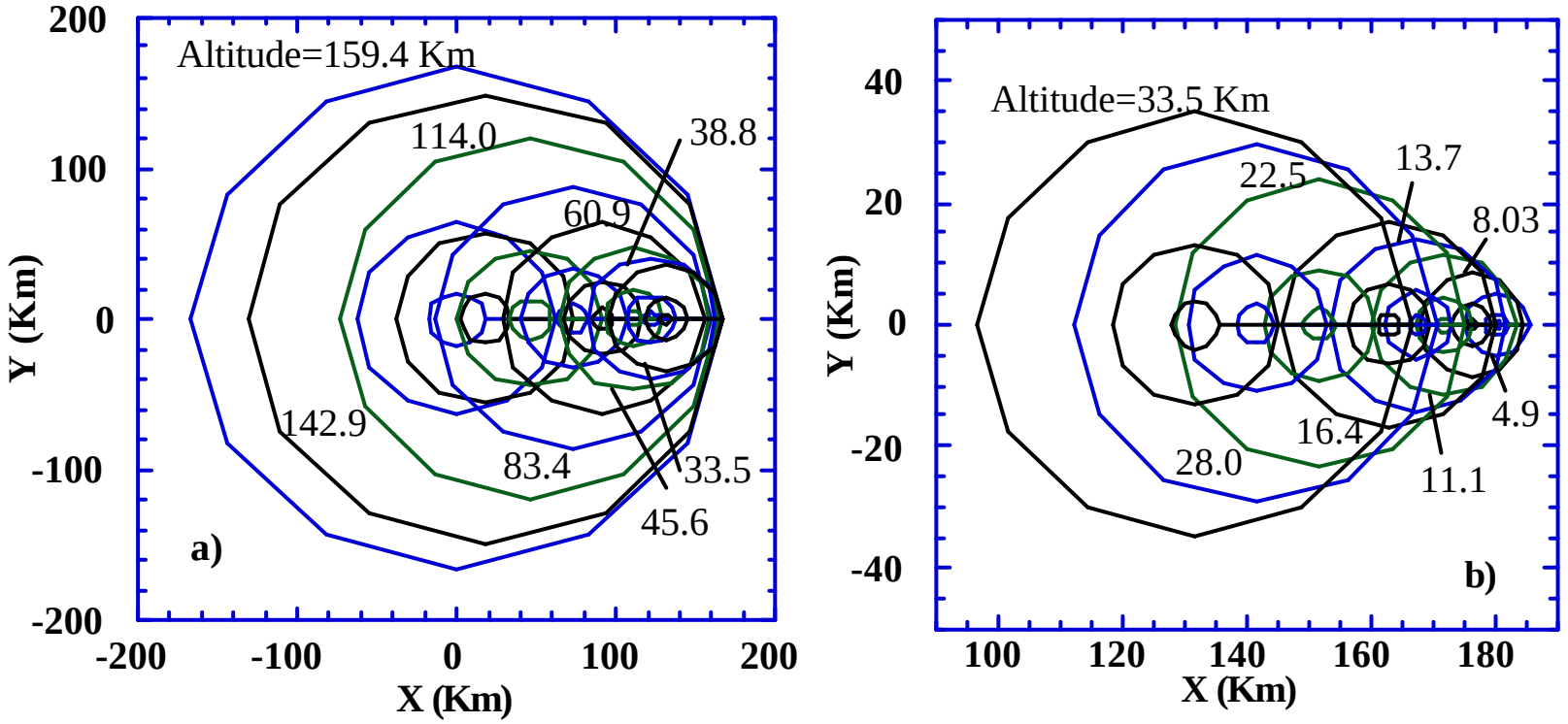

I R SPECTROMETER
SYSTEM ASSEMBLY
CRAFTSMAN

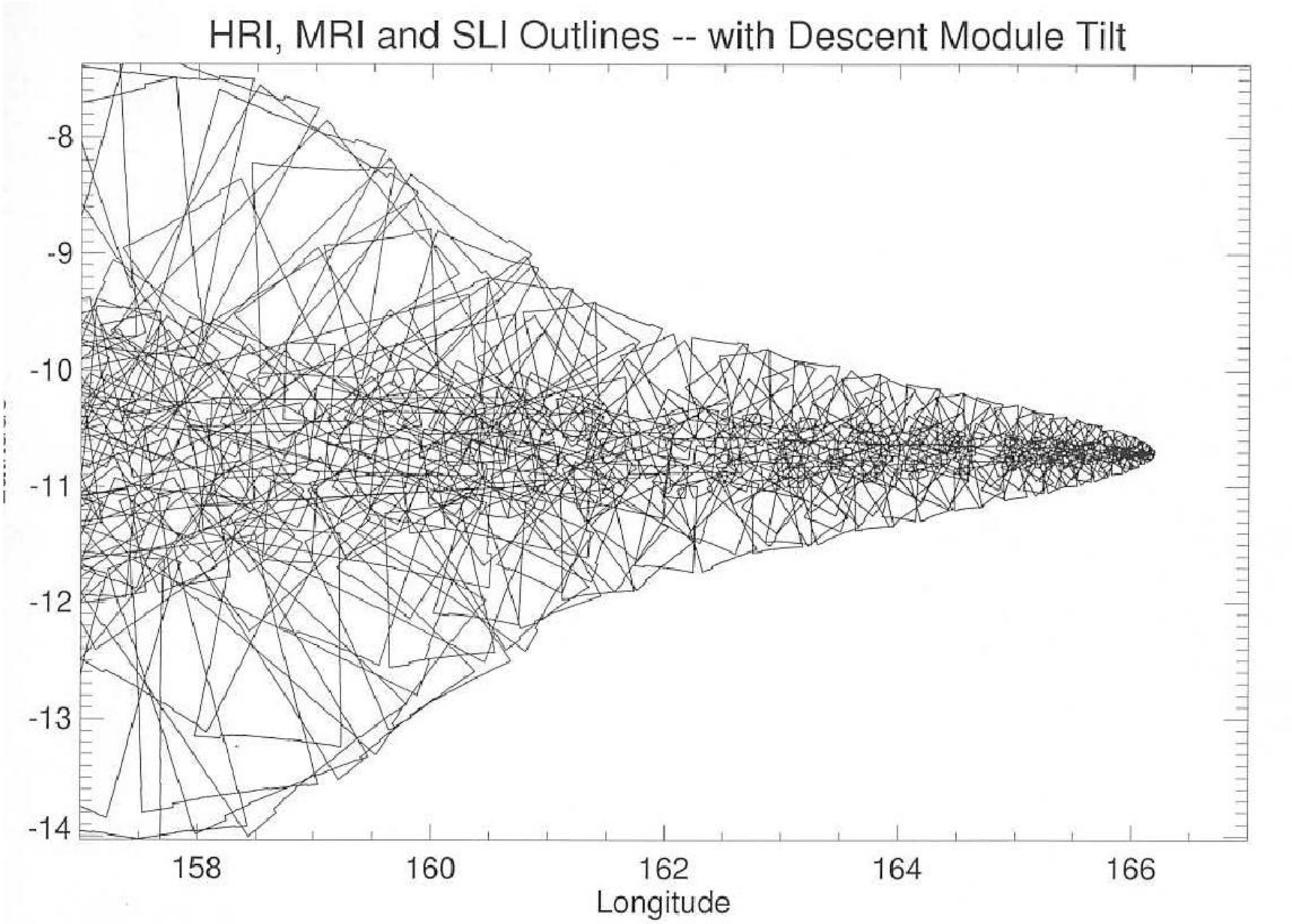


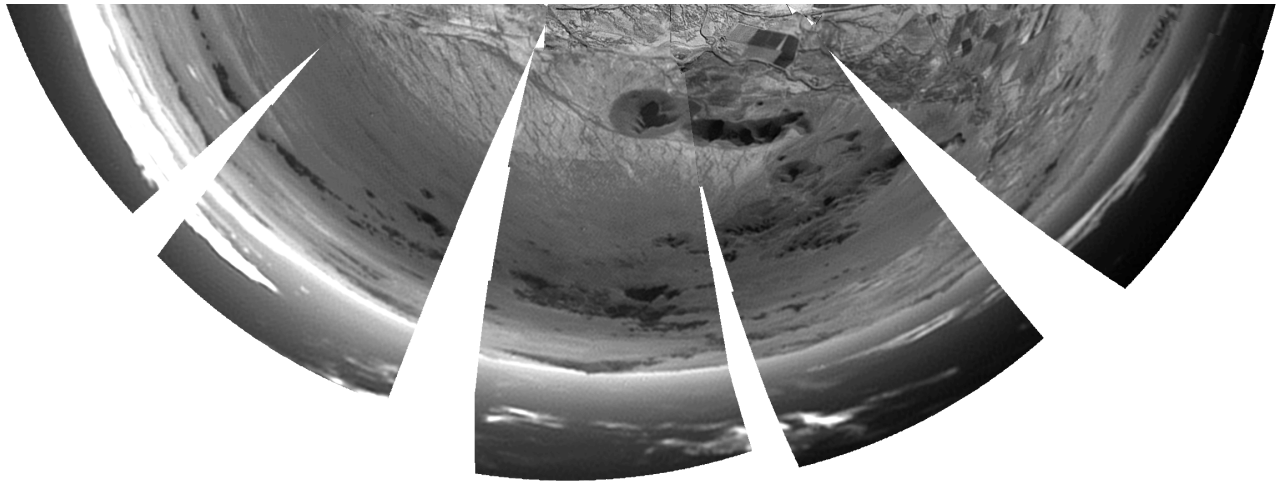


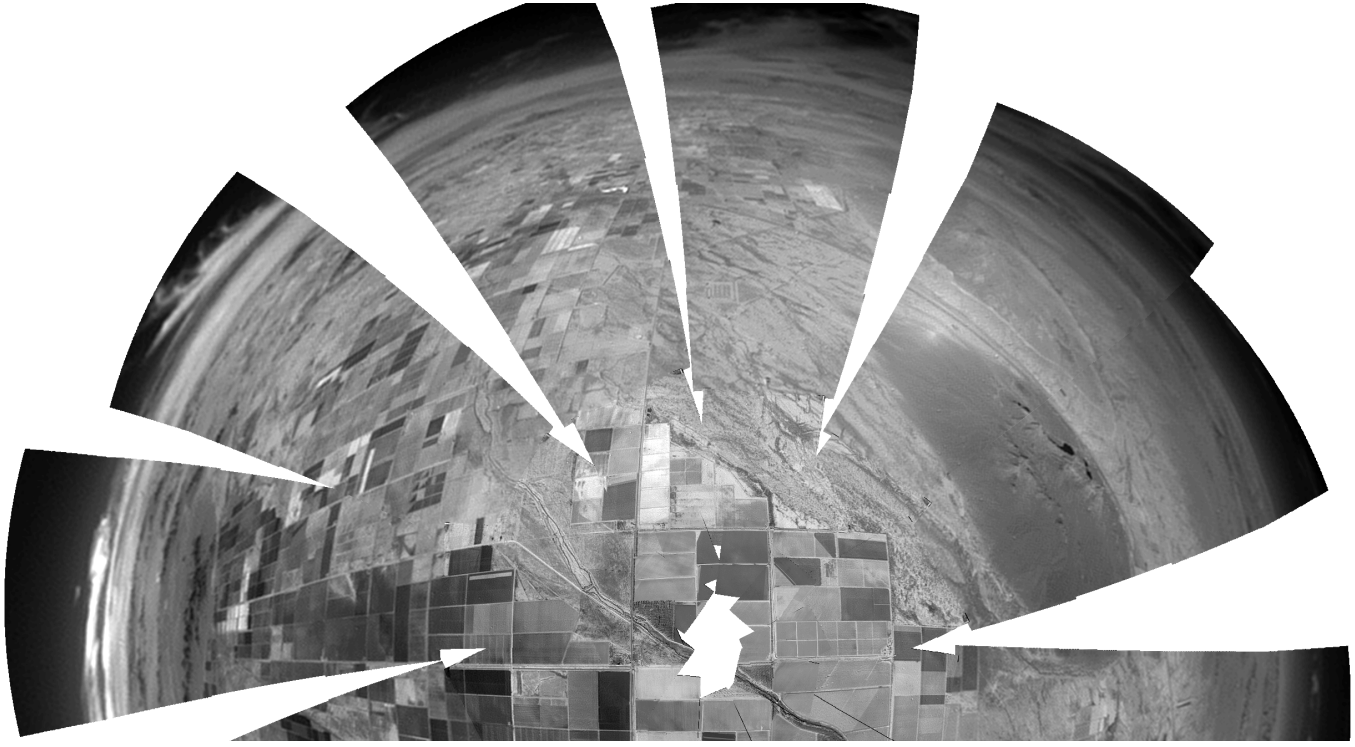

Spectral Response of Imaging Channels
Relative Spectral Response
1.0
0.8
0.6
0.4
0.2
0.0
400
500
600
700
800
900
1000
1100
Wavelength (nm)
MRI
Blue Horizontal
Polarization
at row 24
Red Horizontal
Polarization
at row 24

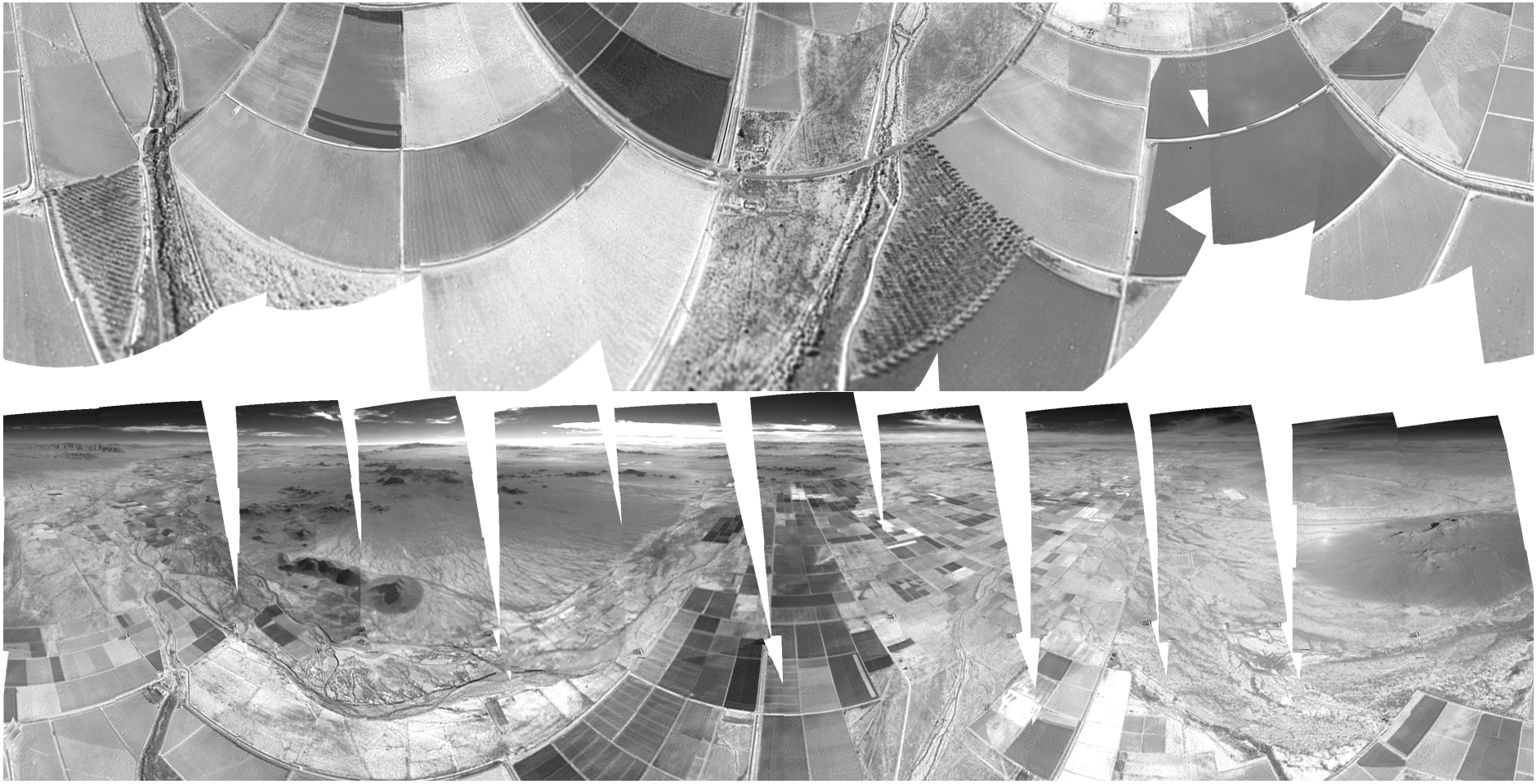

Cycle Types for 4-6-8 Compression
Altitude (km)
100
10
1
0.1
0.01
0
20
40
60
80
100
120
140
Time (minutes)
Img
NoImg
Cal
Drain
HNS
Spect
MNS
LNS
VLNS

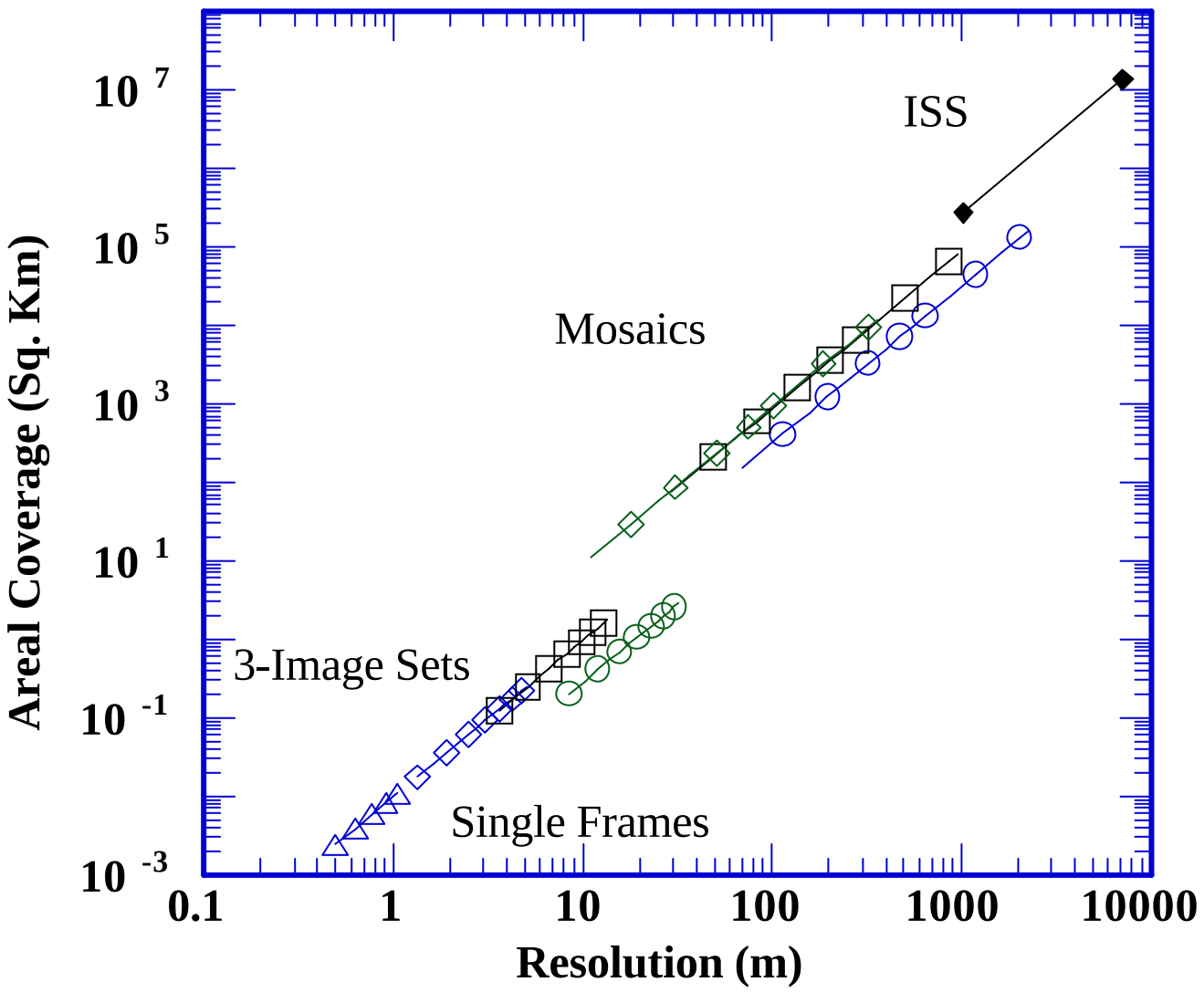

Altitude=159.4 Km
114.0
38.8
60.9
142.9
83.4
33.5
45.6
a)
Y (Km)
X (Km)
200
100
0
-100
-200
-200
-100
0
100
200
Altitude=33.5 Km
22.5
13.7
8.03
4.9
16.4
28.0
11.1
b)
Y (Km)
X (Km)
40
20
0
-20
-40
100
120
140
160
180

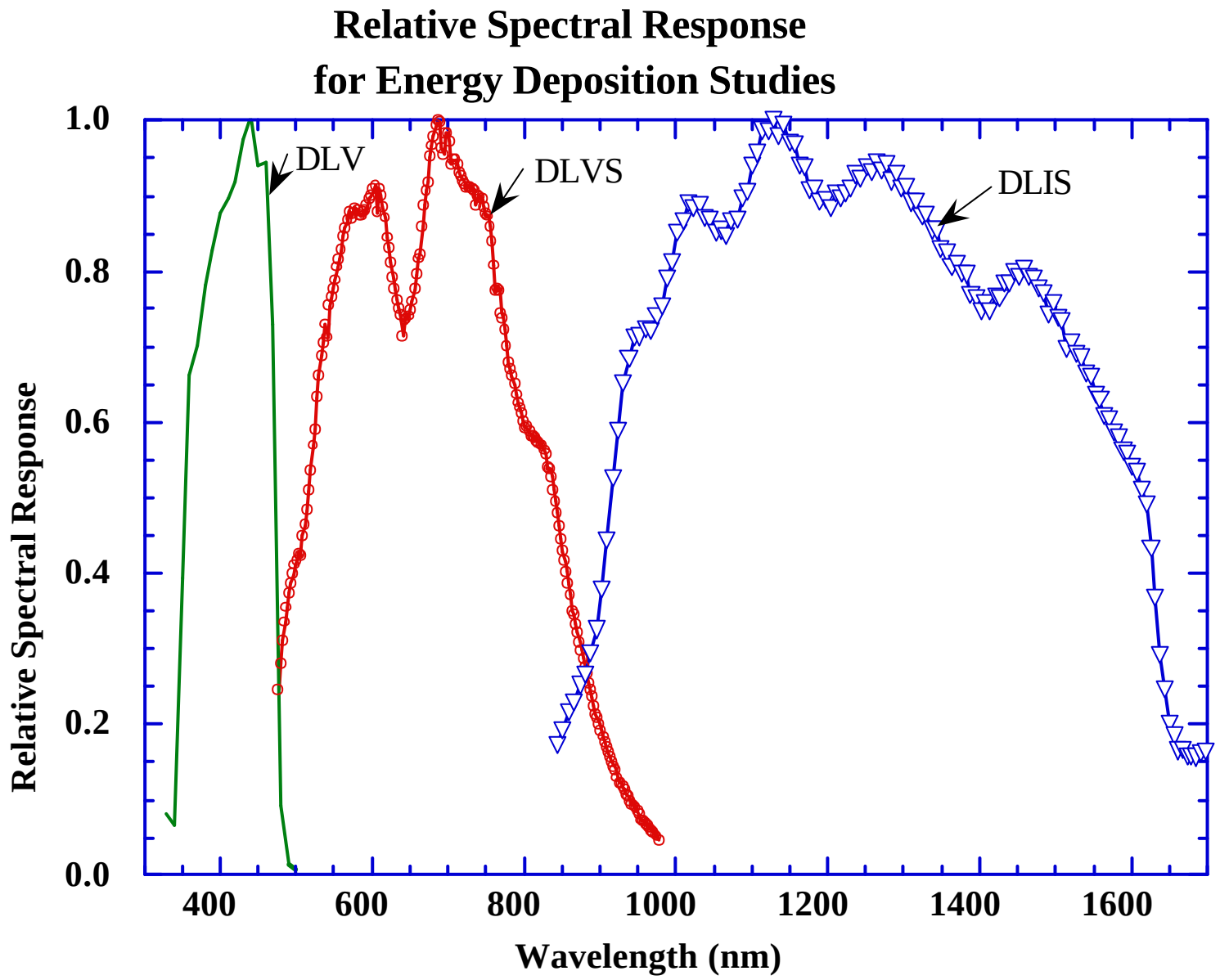

HRI, MRI and SLI Outlines -- with Descent Module Tilt
-8
-9
-10
-11
-12
-13
-14
158
160
162
164
166
Longitude

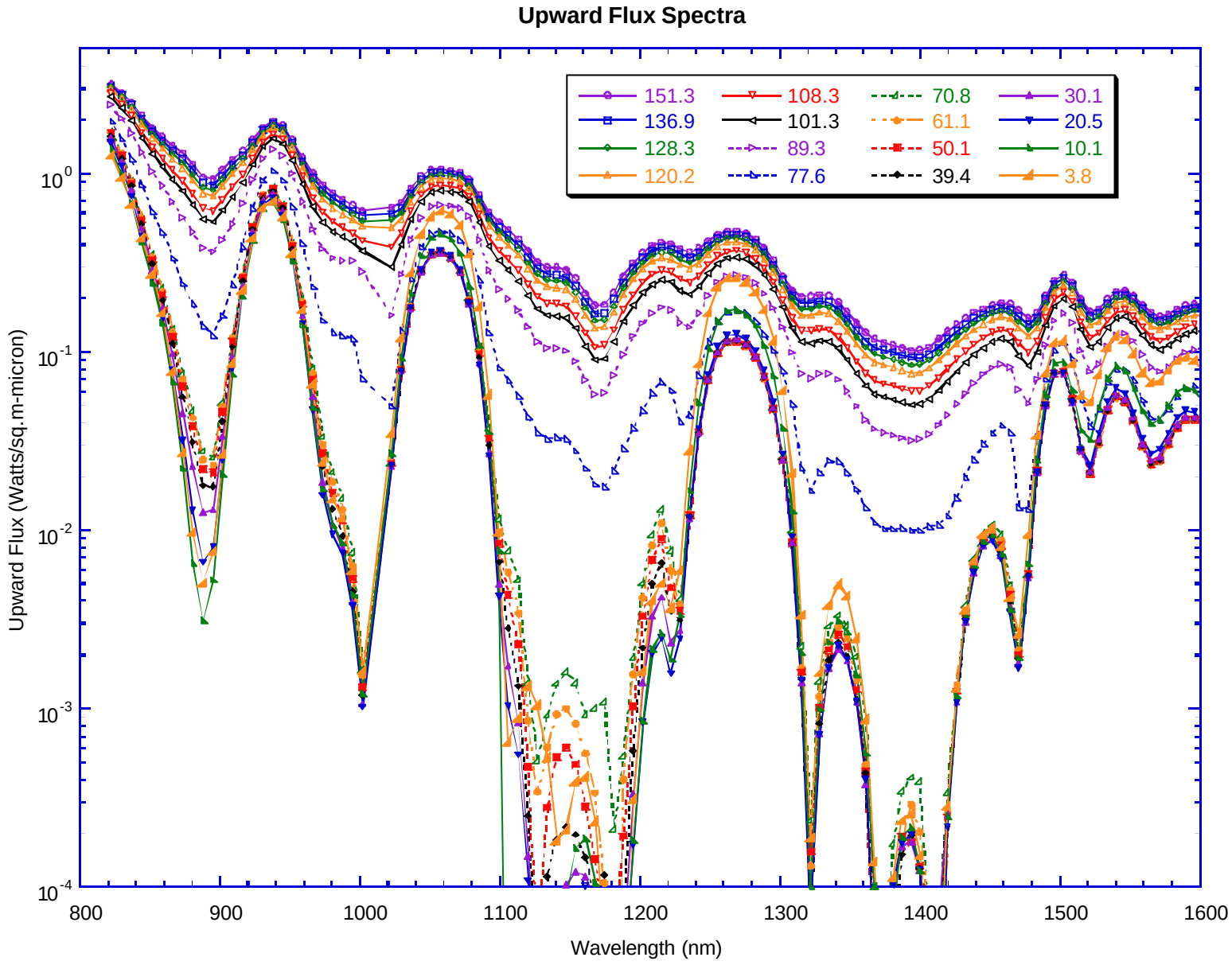


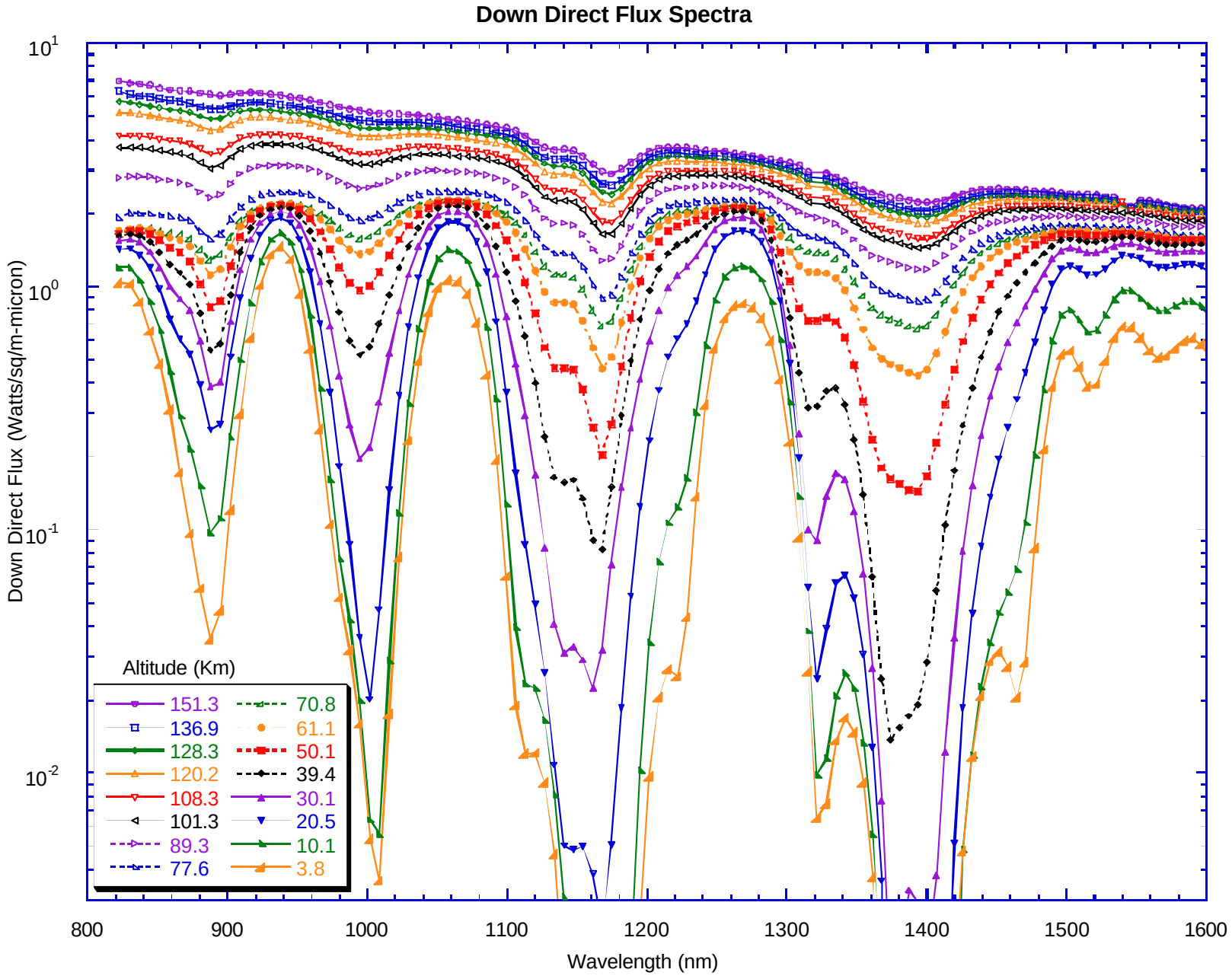


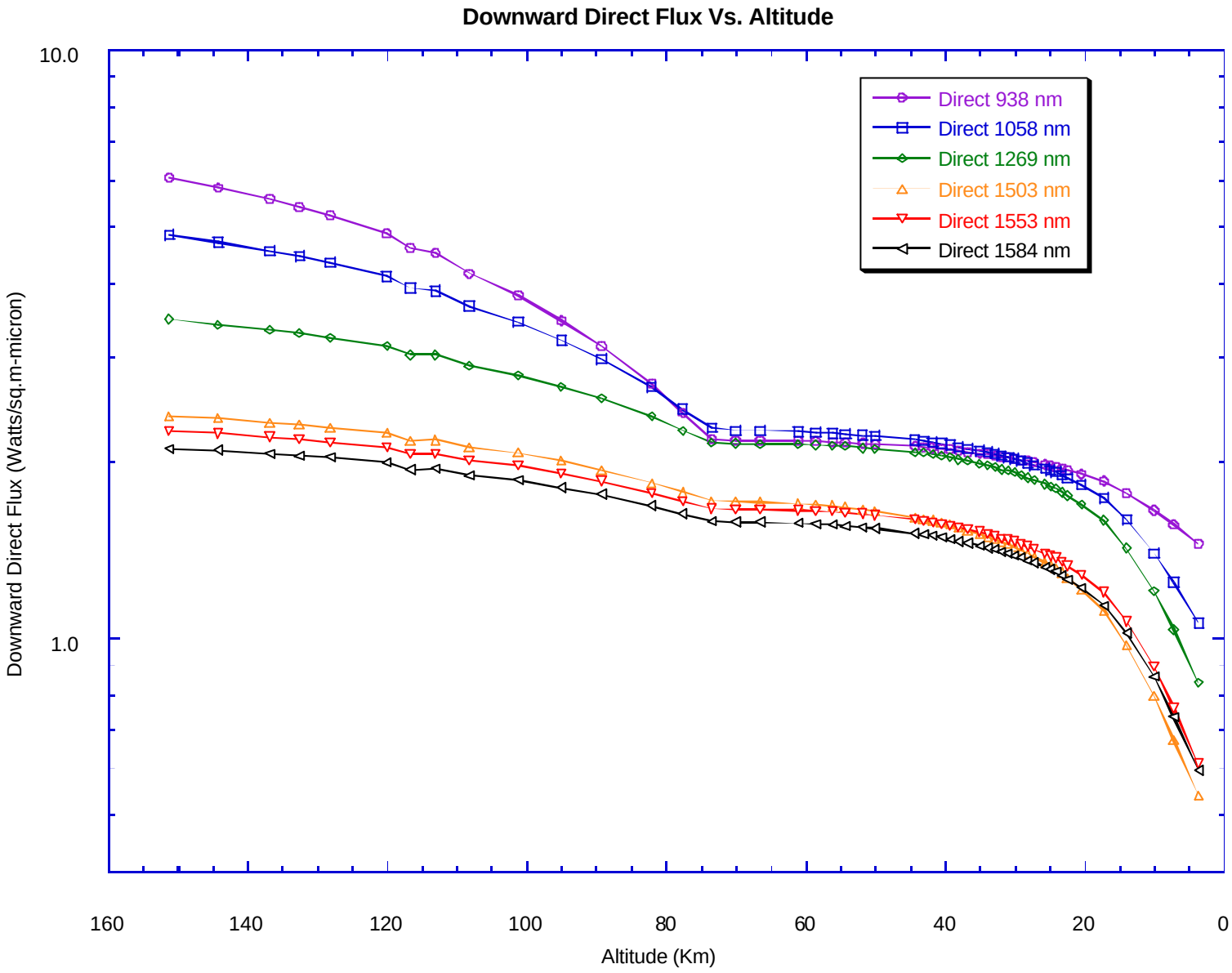


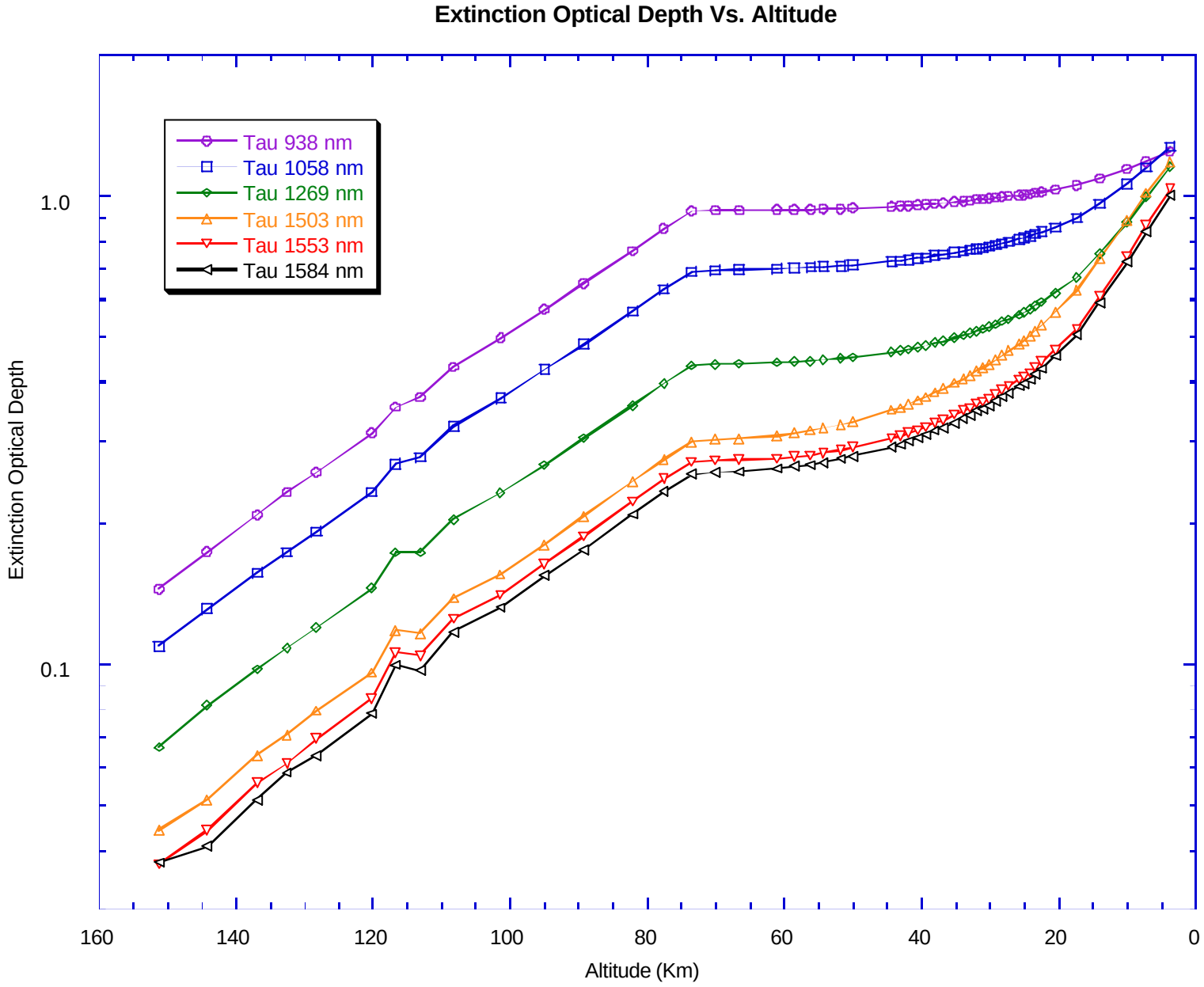

Areal Coverage (Sq. Km)
10 7
10 5
10 3
10 1
10 -1
10 -3
0.1
1
10
100
1000
10000
Resolution (m)
ISS
Mosaics
3-Image Sets
Single Frames

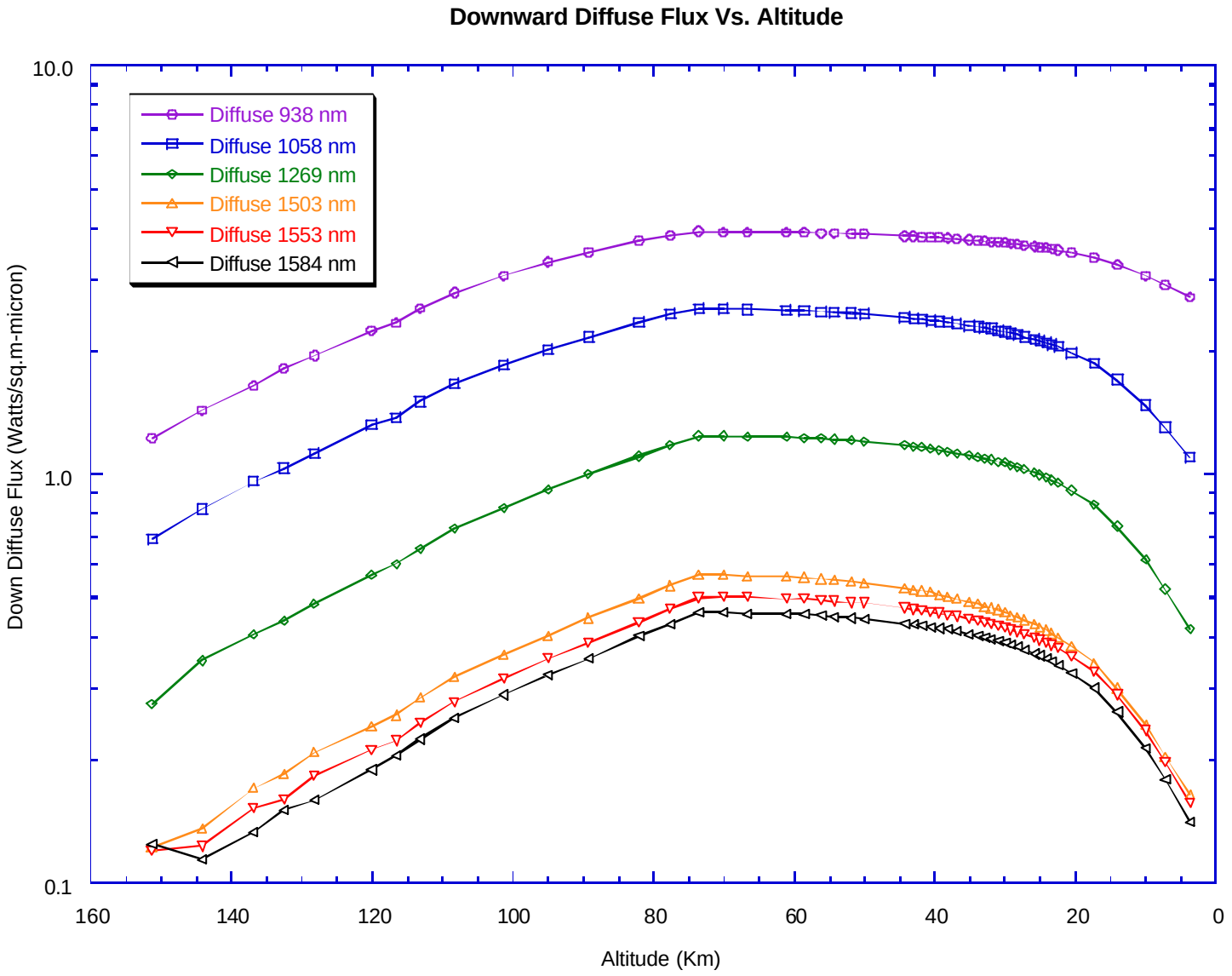

Relative Spectral Response
for Energy Deposition Studies
DLV
DLVS
DLIS
Relative Spectral Response
1.0
0.8
0.6
0.4
0.2
0.0
400
600
800
1000
1200
1400
1600
Wavelength (nm)

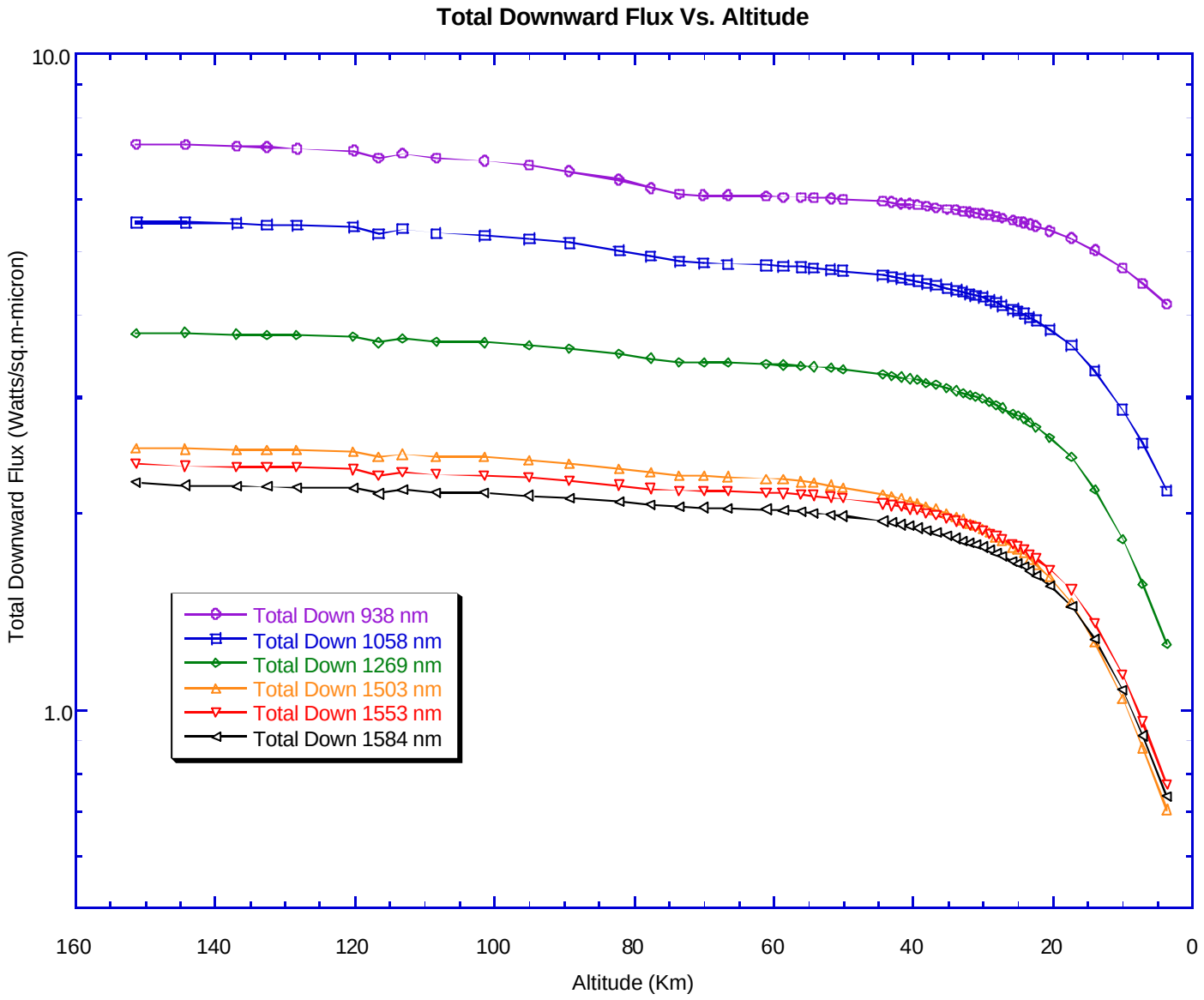

Upward Flux Spectra
151.3
136.9
128.3
120.2
108.3
101.3
89.3
77.6
70.8
61.1
50.1
39.4
30.1
20.5
10.1
3.8
Upward Flux (Watts/sq.m-micron)
Wavelength (nm)
10^0
10^-1
10^-2
10^-3
10^-4
800
900
1000
1100
1200
1300
1400
1500
1600


Down Direct Flux Spectra
Down Direct Flux (Watts/sq/m-micron)
Wavelength (nm)
Altitude (Km)
151.3
136.9
128.3
120.2
108.3
101.3
89.3
77.6
70.8
61.1
50.1
39.4
30.1
20.5
10.1
3.8

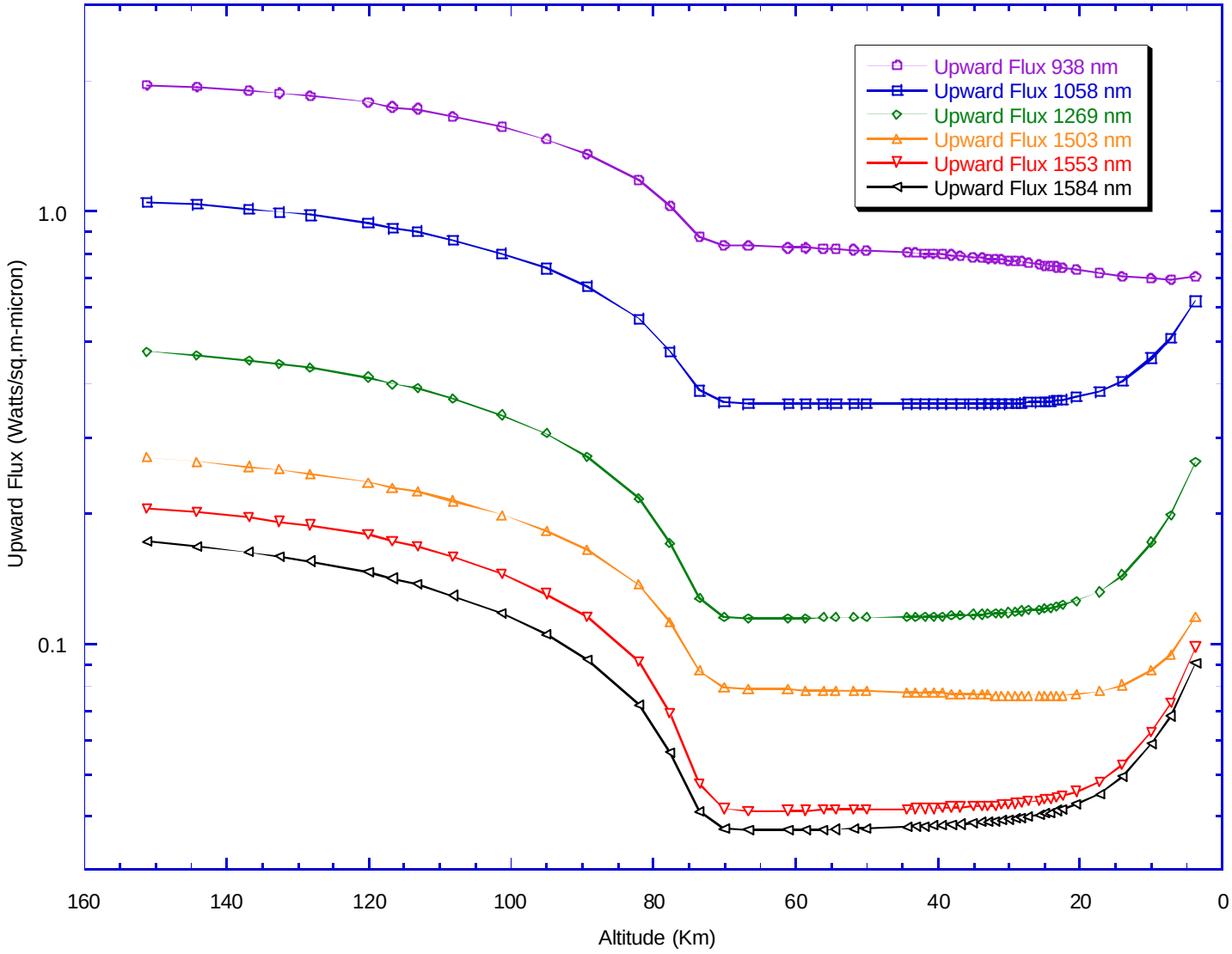

Downward Direct Flux Vs. Altitude
10.0
1.0
Downward Direct Flux (Watts/sq.m-micron)
160
140
120
100
80
60
40
20
0
Altitude (Km)
Direct 938 nm
Direct 1058 nm
Direct 1269 nm
Direct 1503 nm
Direct 1553 nm
Direct 1584 nm

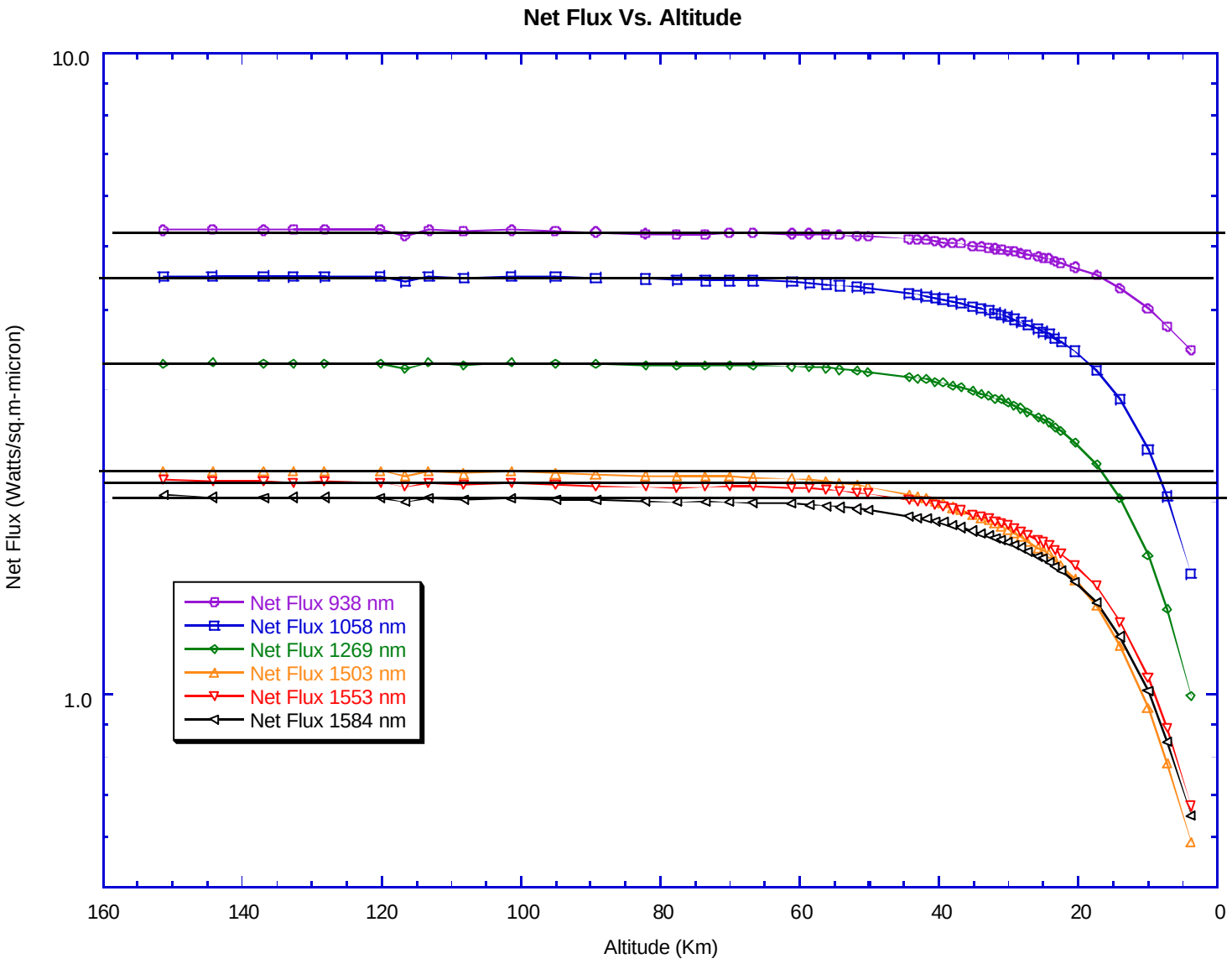

Extinction Optical Depth Vs. Altitude
Tau 938 nm
Tau 1058 nm
Tau 1269 nm
Tau 1503 nm
Tau 1553 nm
Tau 1584 nm
1.0
0.1
Extinction Optical Depth
160
140
120
100
80
60
40
20
0
Altitude (Km)

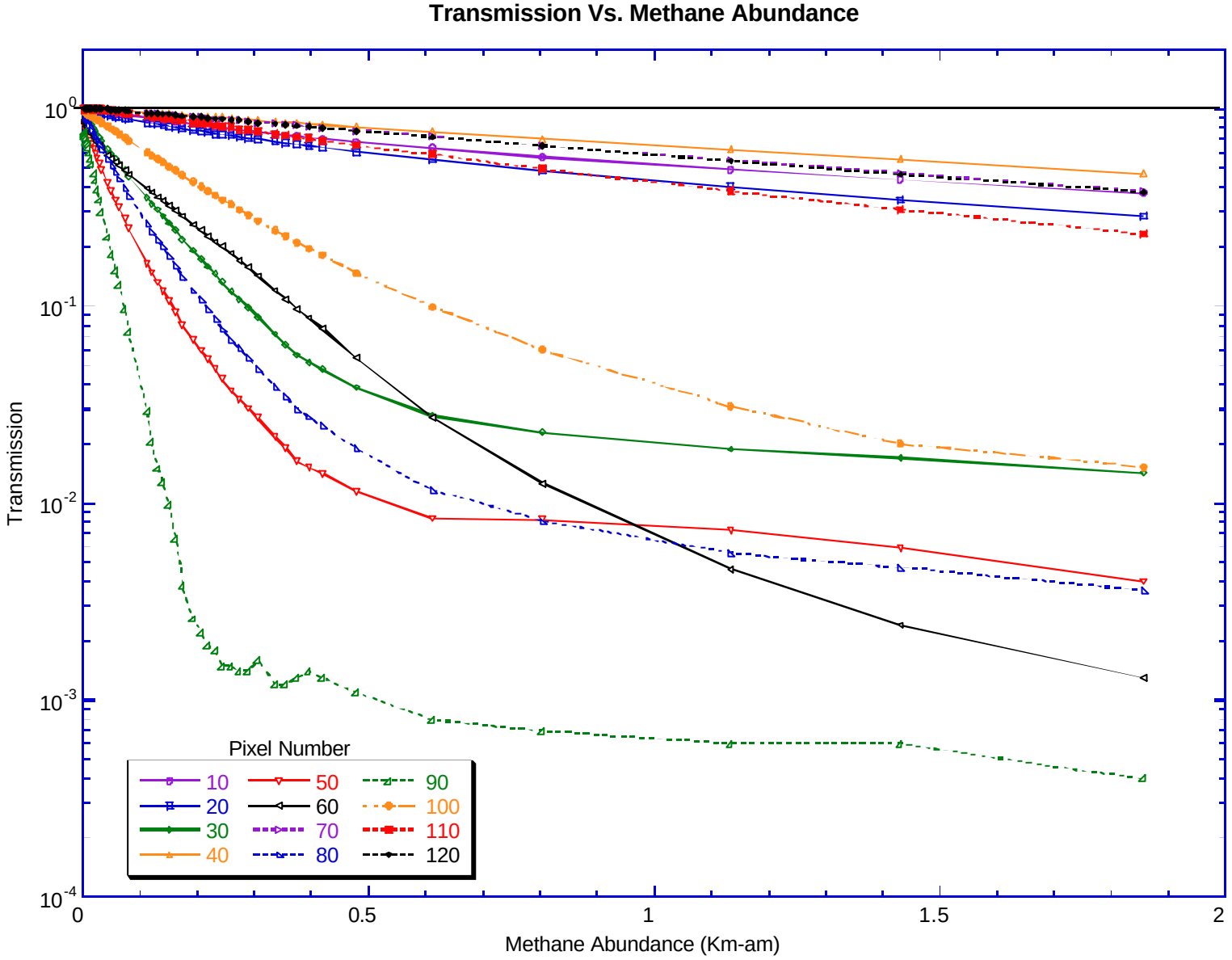

Downward Diffuse Flux Vs. Altitude
Down Diffuse Flux (Watts/sq.m-micron)
10.0
1.0
0.1
160
140
120
100
80
60
40
20
0
Altitude (Km)
Diffuse 938 nm
Diffuse 1058 nm
Diffuse 1269 nm
Diffuse 1503 nm
Diffuse 1553 nm
Diffuse 1584 nm


Total Downward Flux Vs. Altitude
10.0
1.0
Total Downward Flux (Watts/sq.m-micron)
160
140
120
100
80
60
40
20
0
Altitude (Km)
Total Down 938 nm
Total Down 1058 nm
Total Down 1269 nm
Total Down 1503 nm
Total Down 1553 nm
Total Down 1584 nm

Upward Flux Vs. Altitude




Net Flux Vs. Altitude
10.0
1.0
Net Flux (Watts/sq.m-micron)
160
140
120
100
80
60
40
20
0
Altitude (Km)
Net Flux 938 nm
Net Flux 1058 nm
Net Flux 1269 nm
Net Flux 1503 nm
Net Flux 1553 nm
Net Flux 1584 nm


Transmission Vs. Methane Abundance
Transmission
Methane Abundance (Km-am)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0
0.5
1
1.5
2
Pixel Number
10
20
30
40
50
60
70
80
90
100
110
120

Descent Imager/Spectral Radiometer Science Goals

- Heat Balance and Dynamics
  - Measurement of profile of solar heating rate
  - Computation of Thermal Cooling Rate Profile from gas composition and aerosol model
  - Measurement of wind speed and direction vs. altitude from drift seen in images
  - Measurement of wind shear profile from probe attitude throughout descent

- Measurement of gas composition
  - Methane mixing profile vs. altitude
  - Methane absorption coefficients at long path, cold temperature

Descent Imager/Spectral Radiometer Science Goals

- Aerosol and cloud properties
  - Measurement of scattering, extinction optical depth profiles at many wavelengths
  - Measurement of single scattering phase function, polarizing properties, and single scattering albedo vs. altitude and wavelength
  - Measurement of aerosol size and shape vs. altitude
  - Measurement of aerosol number density vs. altitude
  - Derivation of aerosol mass production rate and atmospheric vertical mixing
  - Detection of thin condensation layers in lower stratosphere from Side Looking Image Strips on every measurement cycle
  - Measurement of size, nature of possible tropospheric storms seen in images made from above

Descent Imager/Spectral Radiometer Science Goals

- Nature of surface
  - Measurement of vertical topography from pairs of mosaics at different altitudes
  - Measurement of visible, near IR reflectance spectra of many points on surface for compositional information
  - Correlation of surface morphology with visible and near IR reflectance measurements for nature of physical processes that form surface
  - Search for pools, streams, or lakes of liquid hydrocarbons that could serve as source for methane to atmosphere
  - Search for deposits of solid hydrocarbons (“tholins”) that may rain out of atmosphere