PDS-SBN Review of New Horizons LEISA (Cruise) Data

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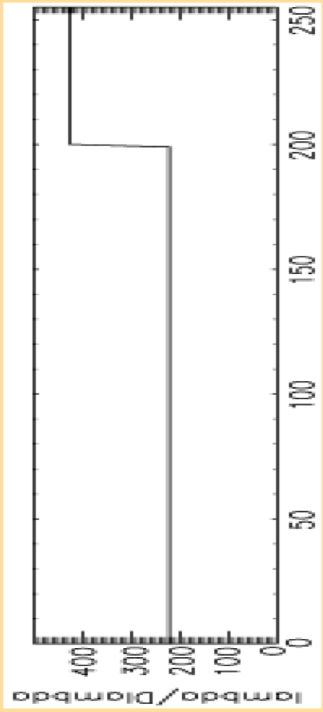
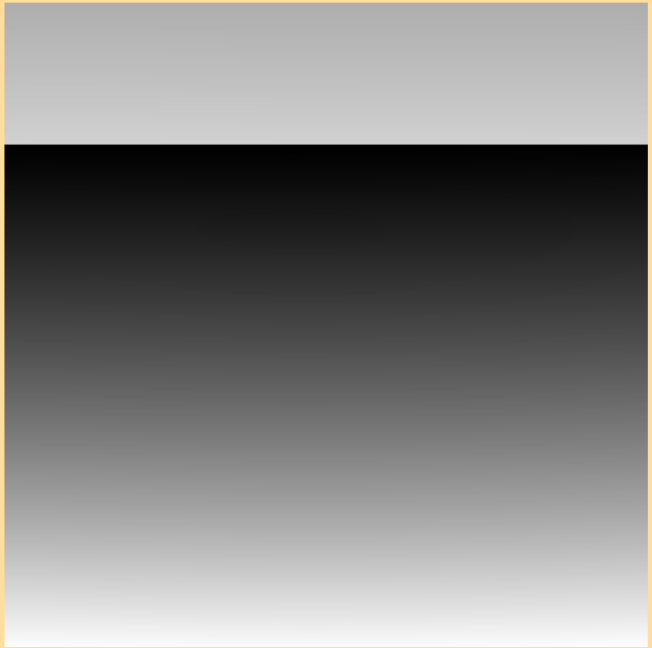
LEISA

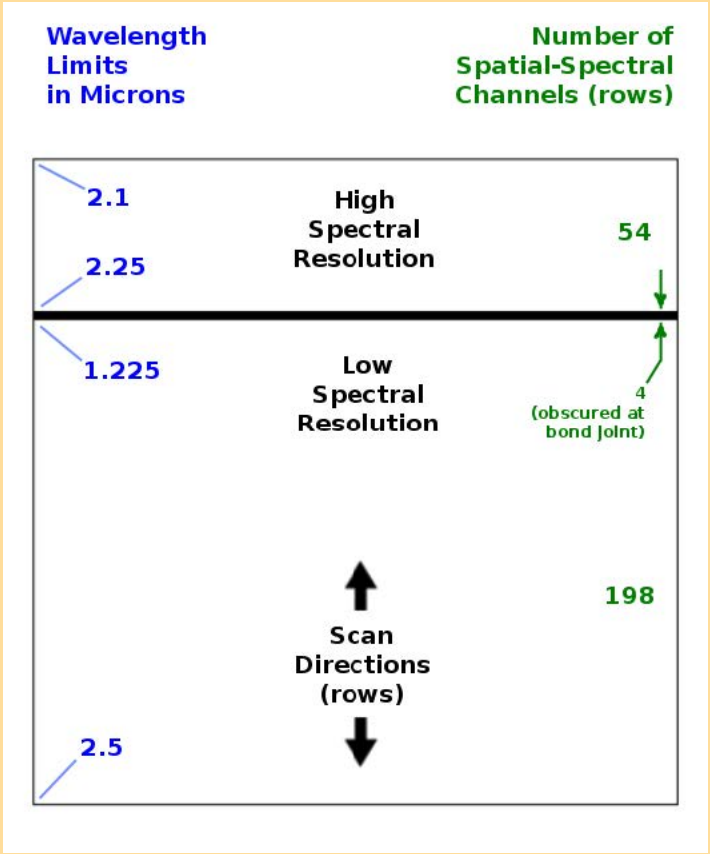
A near-IR (1.2 – 2.5 micron) spectrometer that uses a 256x256 Rockwell PICNIC array, with 40 micron square pixels.

It produces low-resolution ($\lambda/\Delta\lambda$ ~ 240) and higher-resolution ($\lambda/\Delta\lambda$ ~ 540) spectra over separate sections (ranges of 54 and 199 rows) that are separated by 4 rows obscured by a bond joint.

Note: "Hi-res" $\lambda/\Delta\lambda$ ~ 425 for Pluto flyby data, but 540 for cruise phase







A spatial-spectral data cube is created by scanning the FOV across the target in a “push-broom” fashion. The data cube is a 3-dimensional array having 256x256xN elements, where N is the number of 256x256 files accumulated over the scan.

e.g., read in calibrated FITS file = ‘nh-p-leisa-3-pluto-v2.0/data/20150714_029917/lsb_0299172889_0x53c_sci.fit’

file = file(x,y,z),

x=spatial (256 elements),

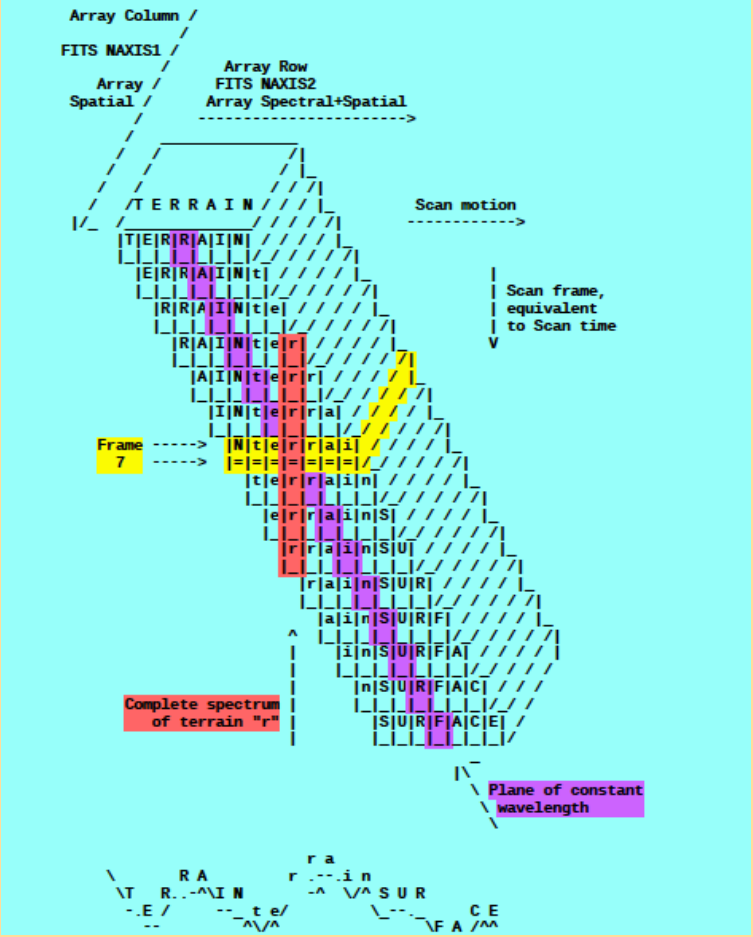
y=lambda(256 elements),

z=spectral/spatial

(N=elements; e.g., N=728)

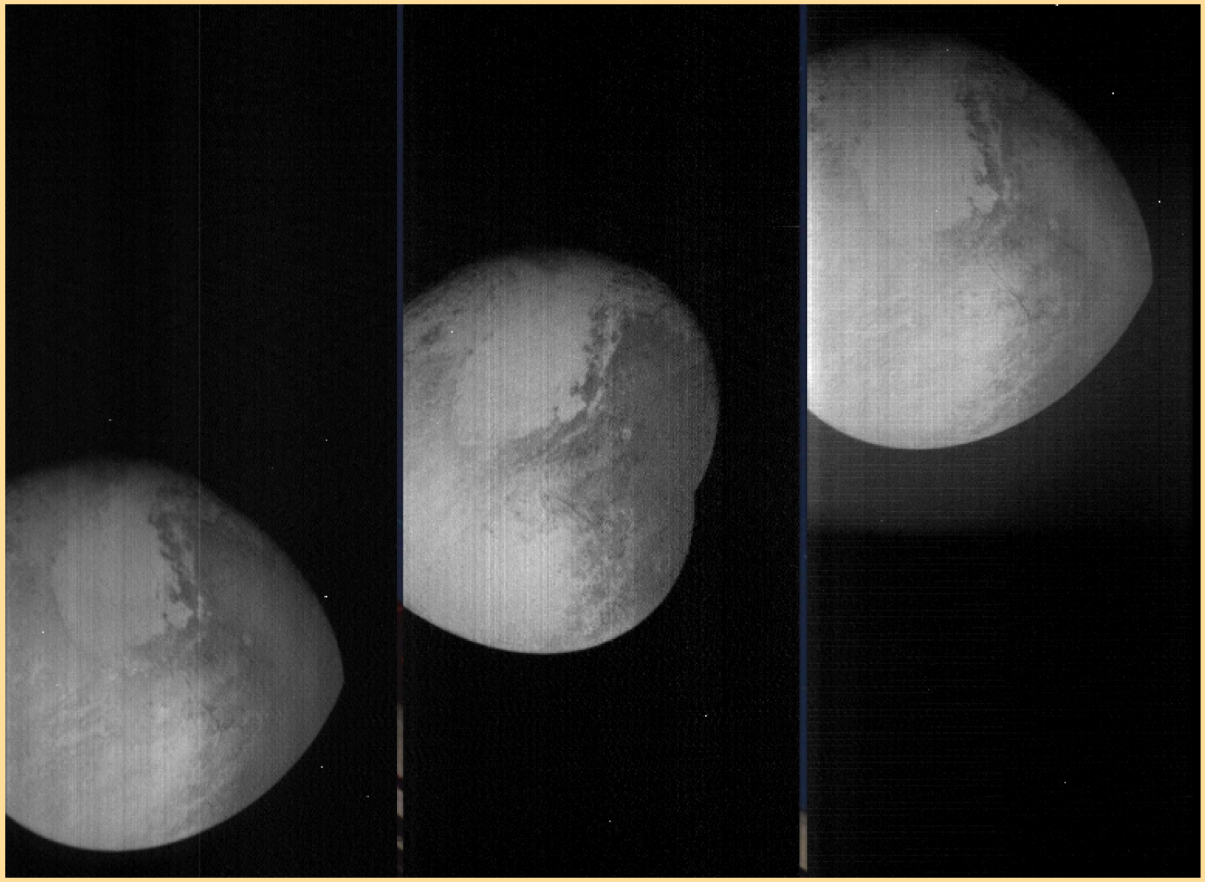
(i.e., lambda varies spatially)

[figure from ‘leisa_data.pdf’ in folder ‘document’]



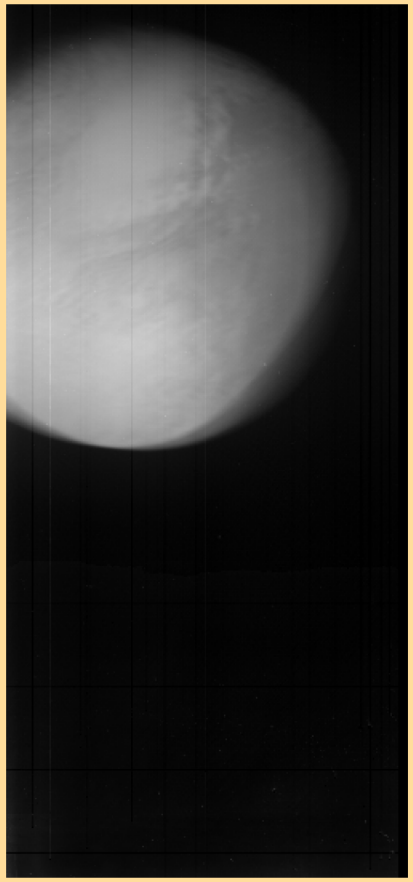
LEISA Pluto flyby Data

Transpose file(x,y,z) [256,256,N] → file_tr(x,z,y) [256,N,256]



file(0:255,0:N-1,0) file(0:255,0:N-1,127) file(0:255,0:N-1,255)

→ shift - register



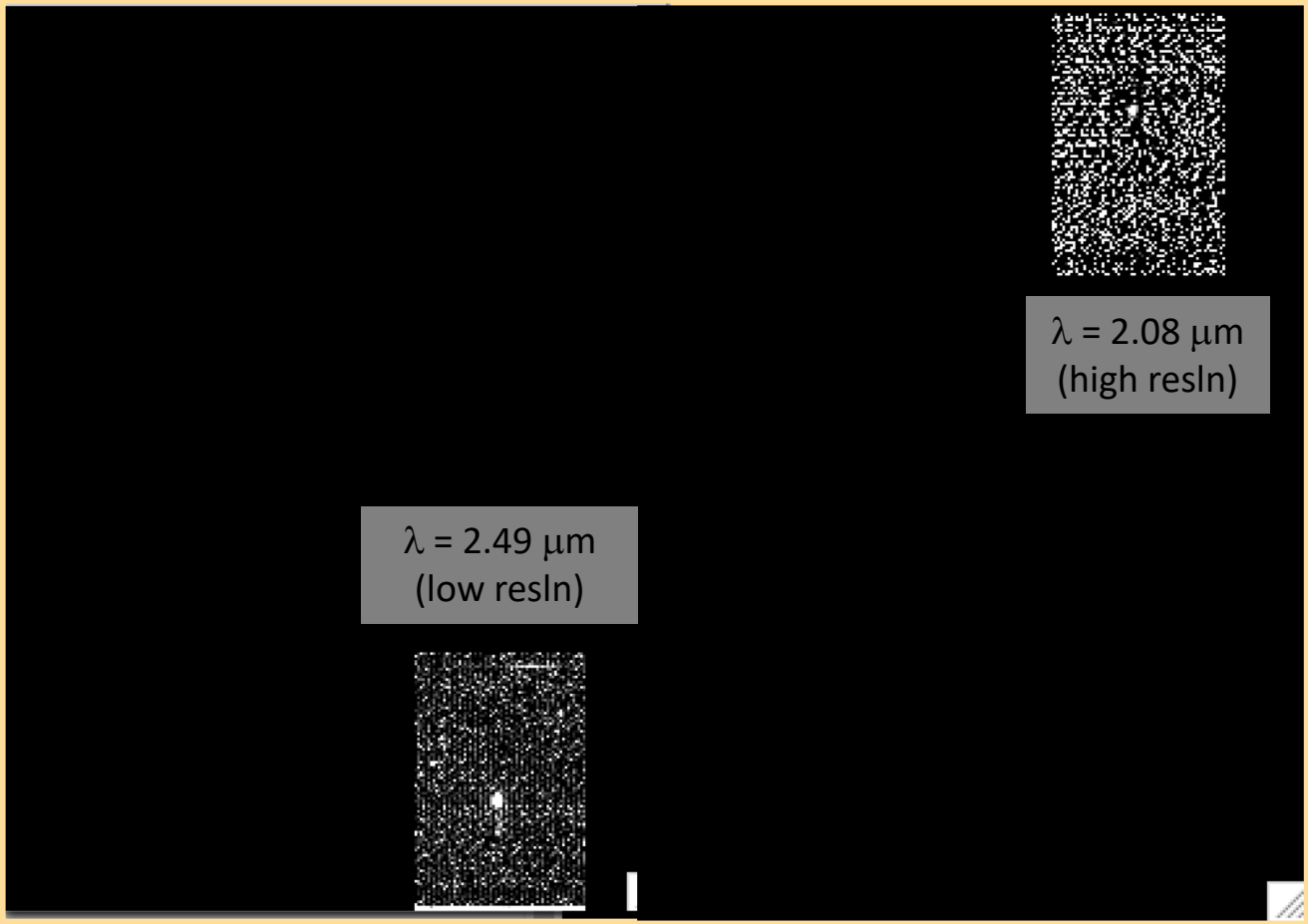
file_tr_sh(0:255,0:N-1,Σ[0:255])
(i.e., over all lambda)

(Some residual wobble in x-dim)

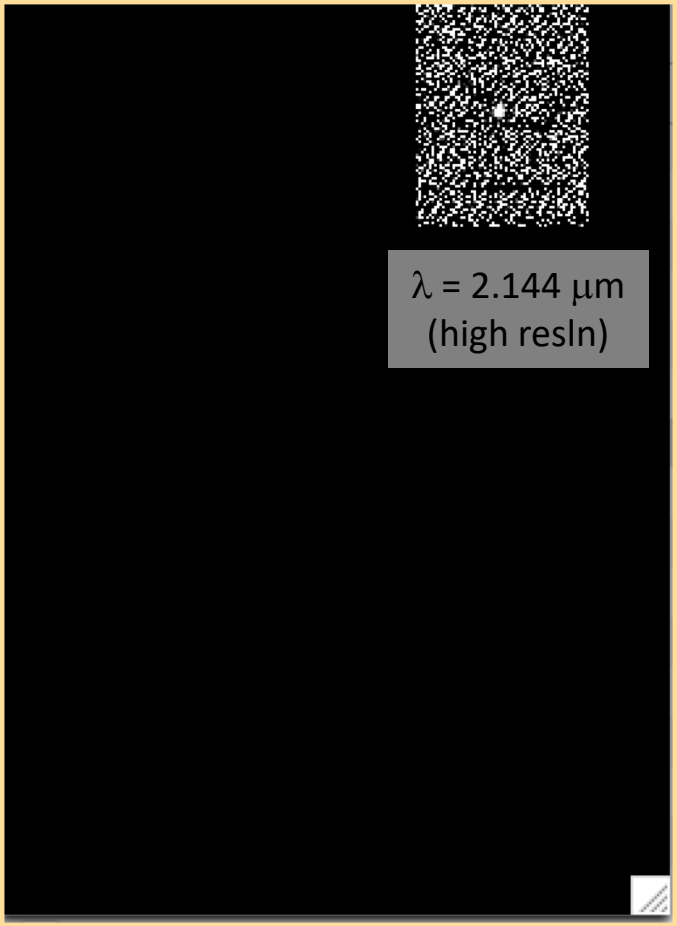
LEISA CRUISE DATA

/data/20170921_036833/lsb_0368336219_0x53c_eng.fit

Arcturus
Unregistered images



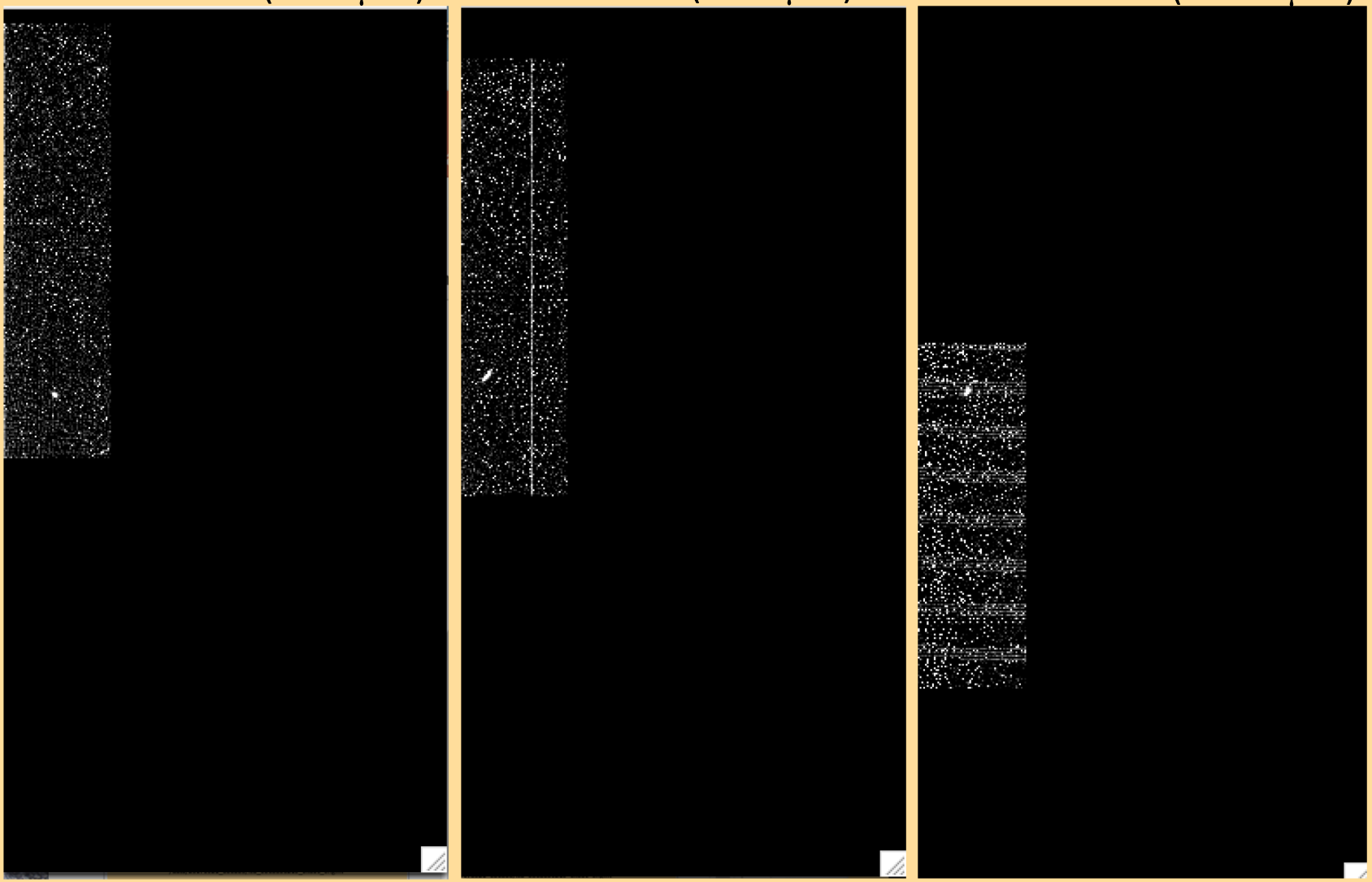
Arcturus
Registered image



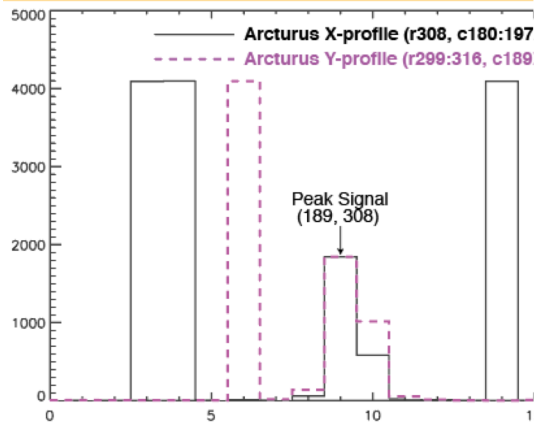
LEISA CRUISE DATA

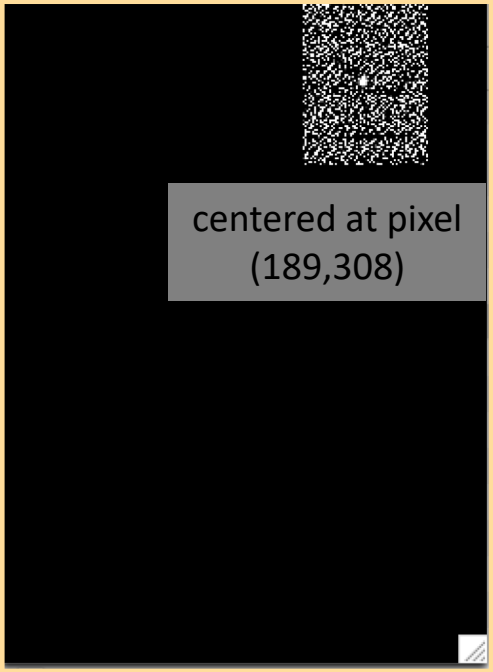
/data/20171103_037203/lsb_0372030719_0x53c_eng.fit
“Calibration”/Alpha Lyrae

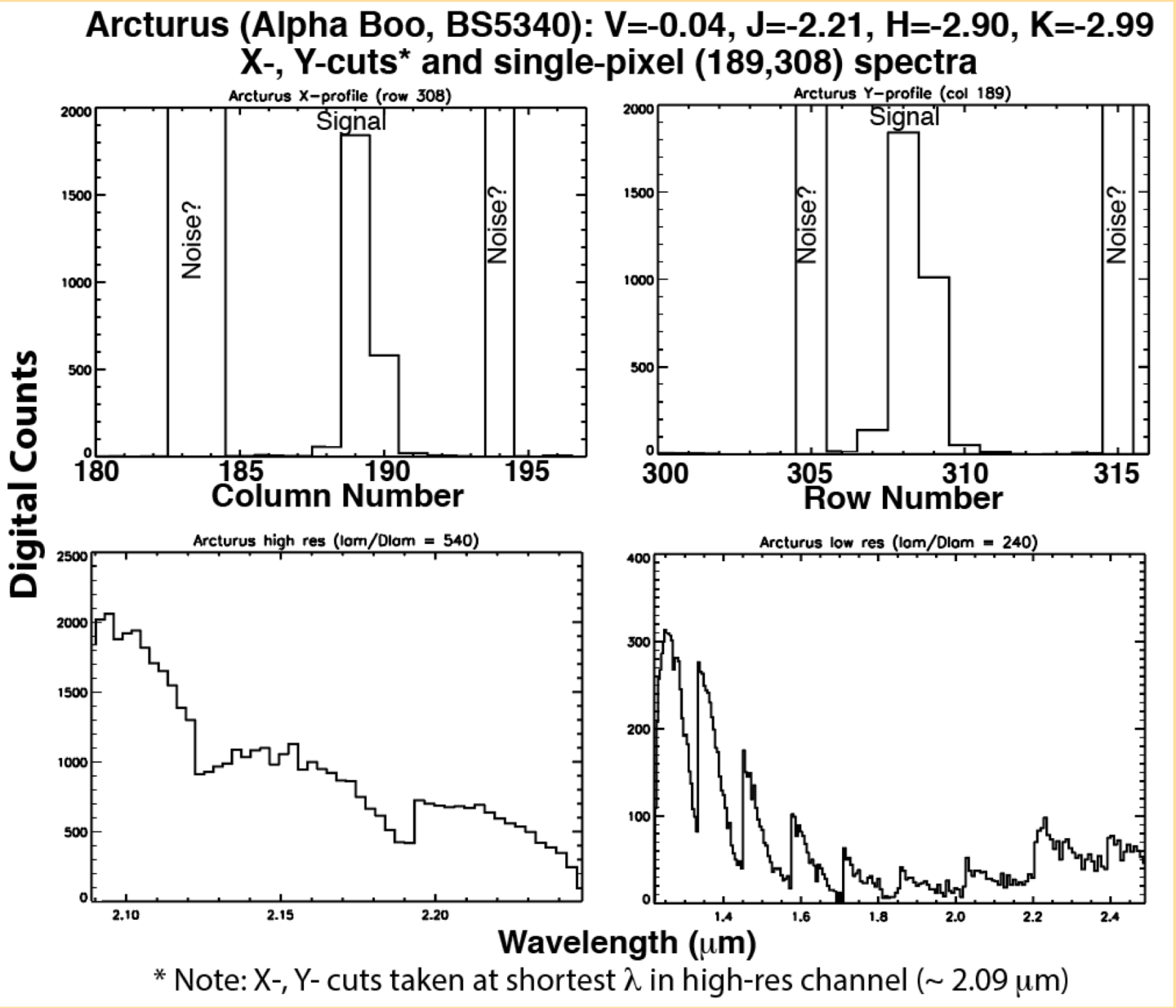
Channel 44 (2.13 μm) Channel 81 (1.86 μm) Channel 255 (2.088 μm)



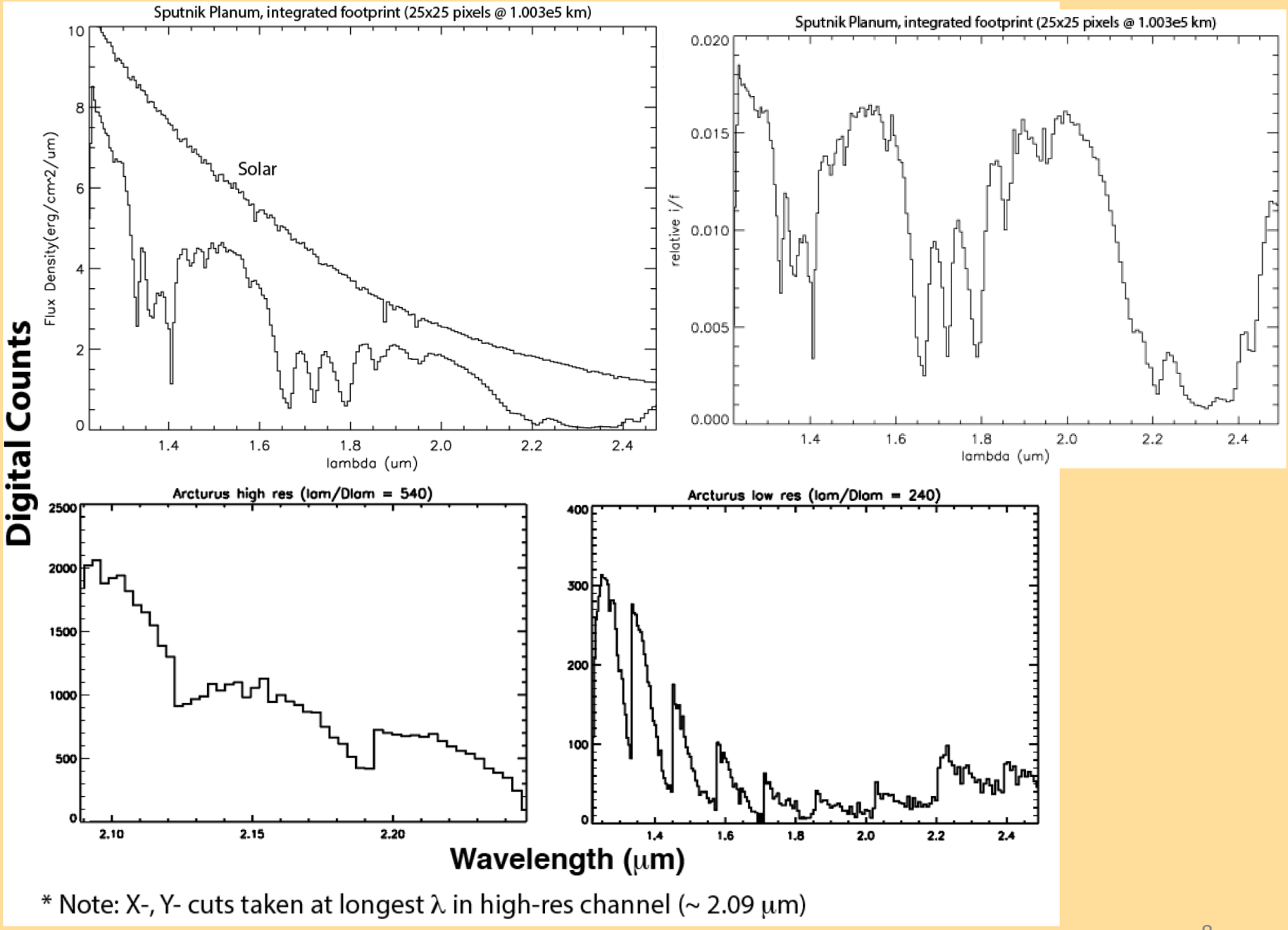
Arcturus: stellar profile and spectral extracts (/data/20170921_036833/lsb_0368336219_0x53c_eng.fit)





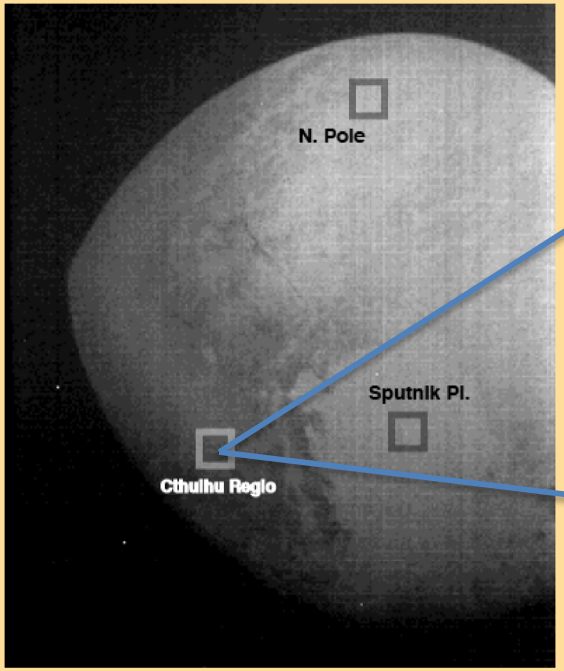


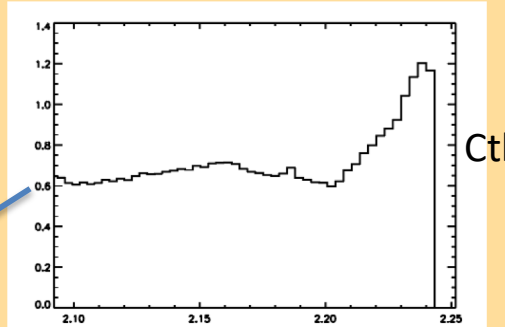
Pluto/Sputnik Planatia; Arcturus



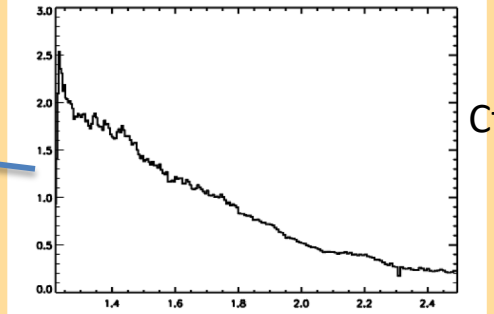
* Note: X-, Y- cuts taken at longest λ in high-res channel (~ 2.09 μm)

Cthulhu Regio – Arcturus Spectral Comparison

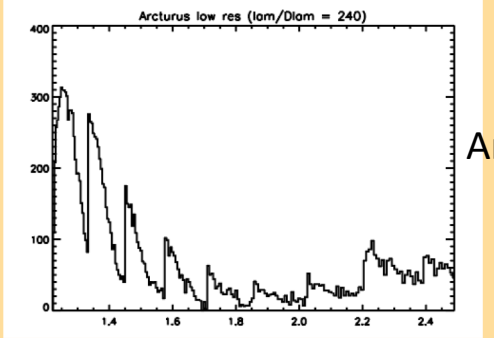




Cthulhu high resolution ($\lambda/\Delta\lambda$ ~ 420)



Cthulhu low resolution ($\lambda/\Delta\lambda$ ~ 240)



Arcturus low resolution ($\lambda/\Delta\lambda$ ~ 240)

Bottom line: Navigation seems good for (some of) the Arcturus observations, but the spectrum is affected by (likely instrumental?) “noise” (and slight wobble in X).