HST Large Proposal

in support of the Juno core mission

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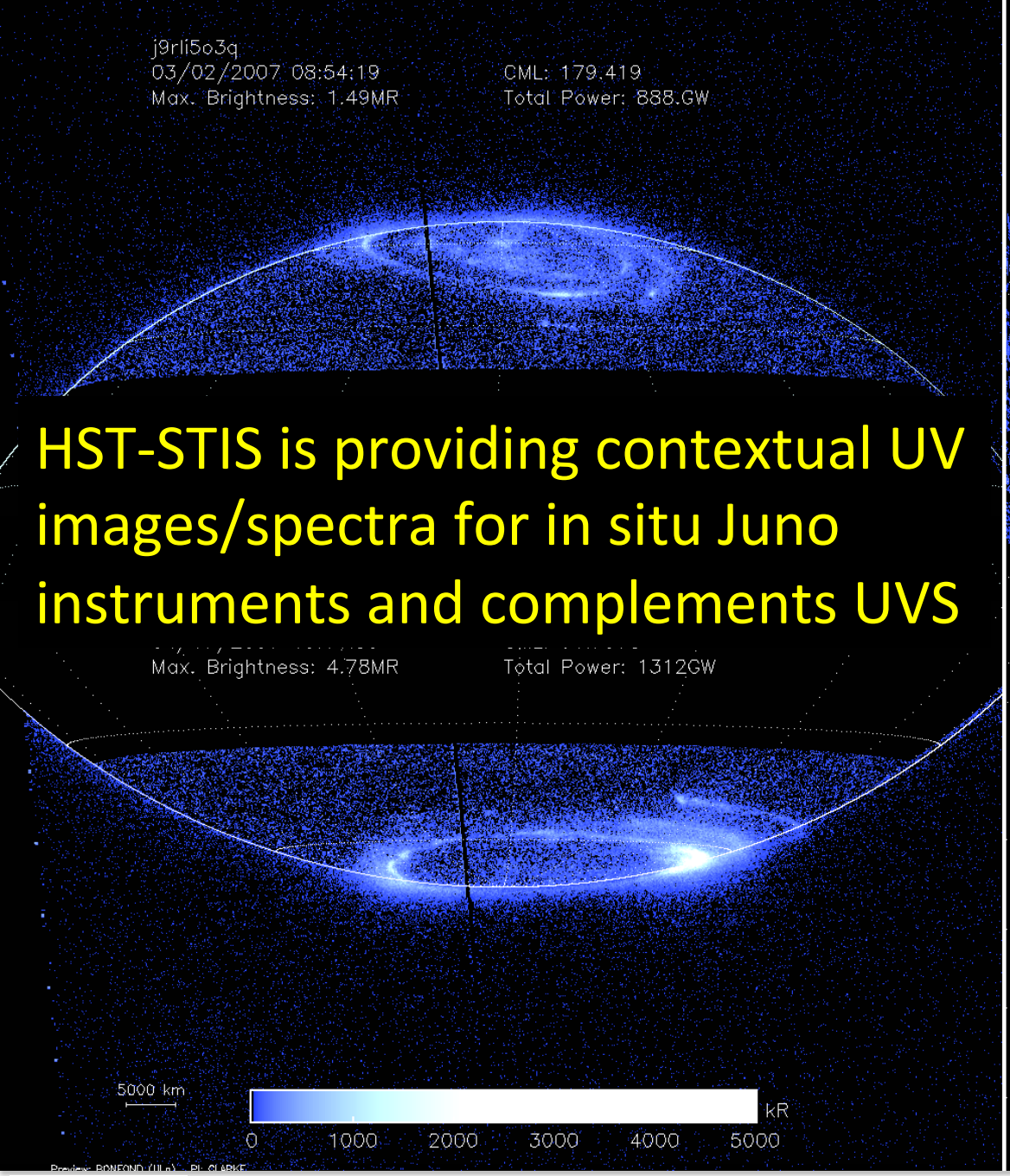
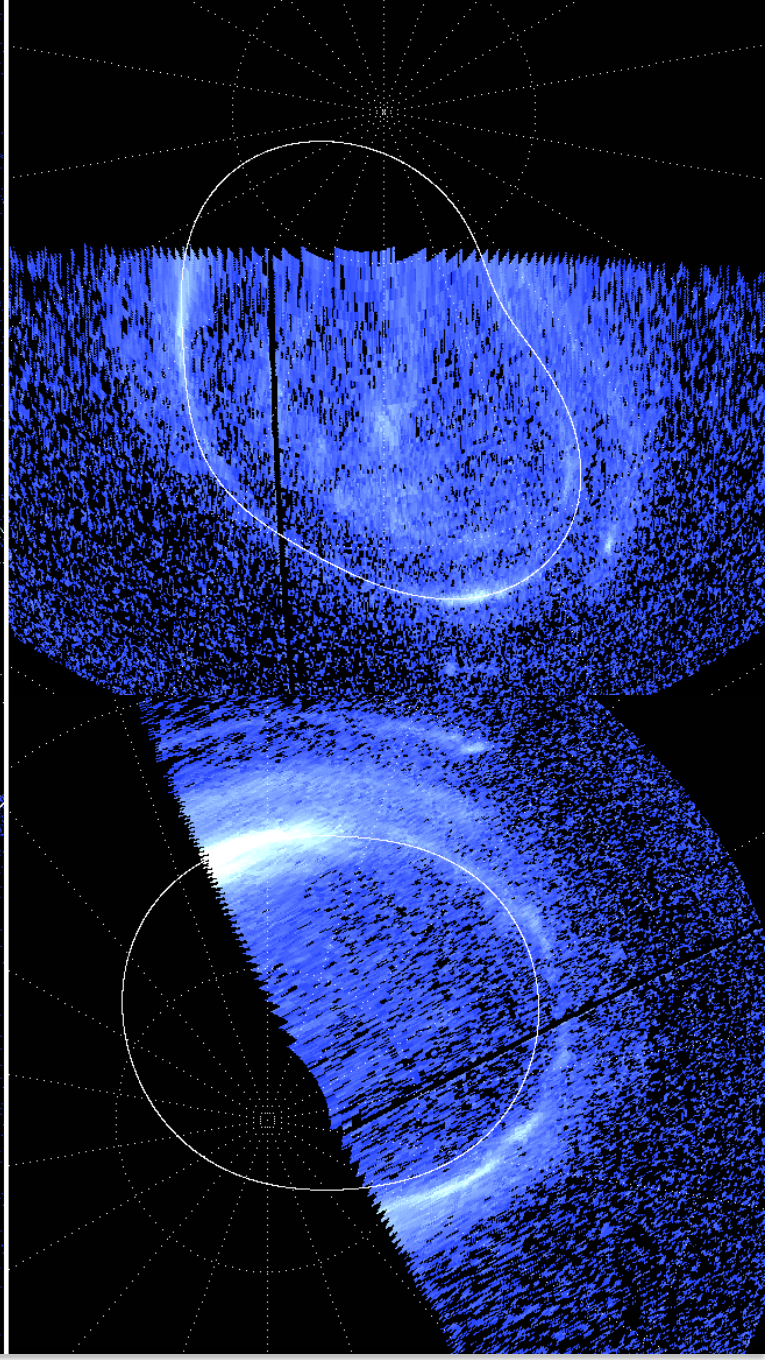




HST-STIS is providing contextual UV images/spectra for in situ Juno instruments and complements UVS

Proposal status - 8 March 2016

First Draft of Science Case ready

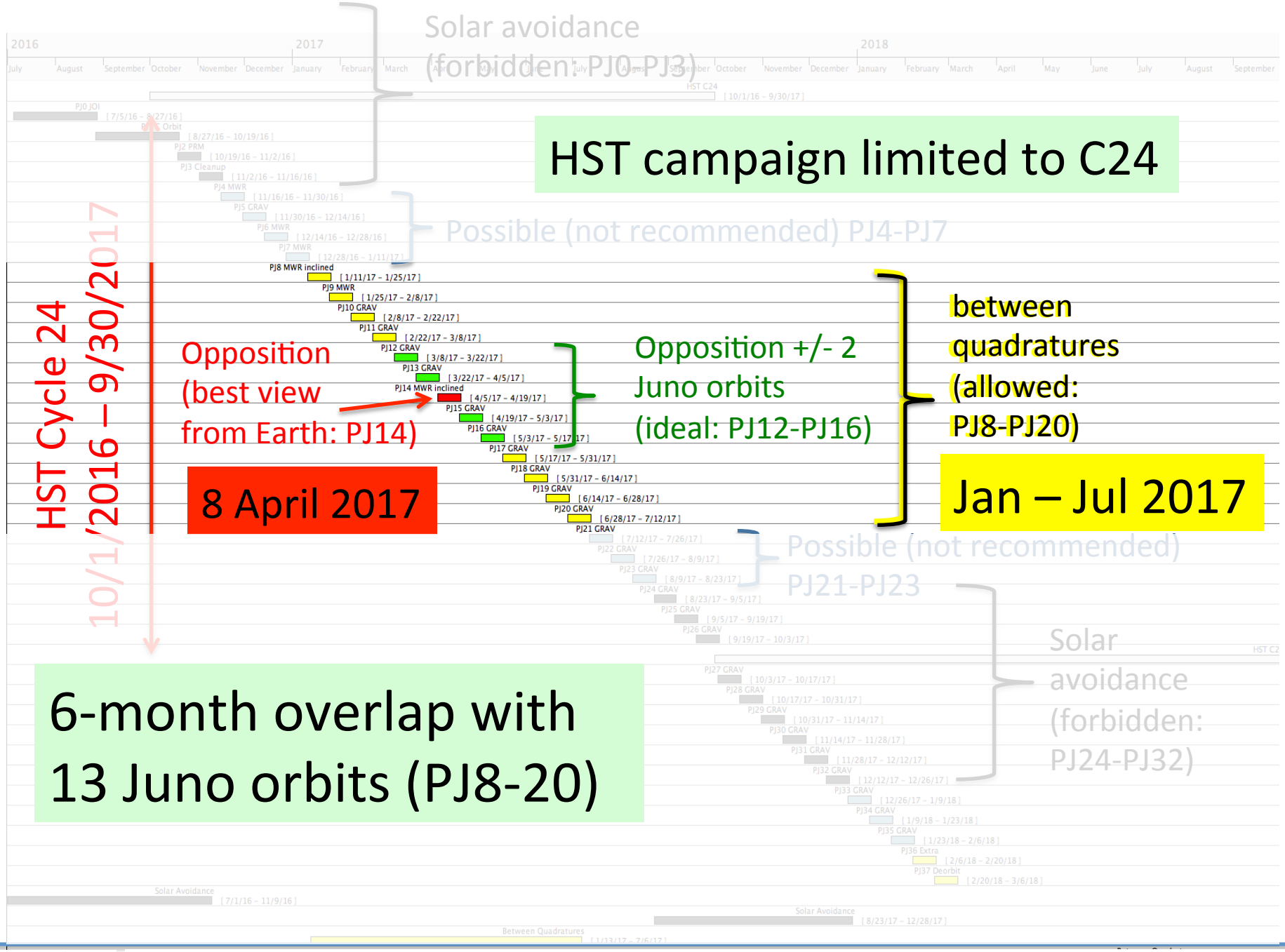
- to be distributed among potential co-Is
- ~ 156 potential HST orbits pre-selected (should reduce to ~ 90)
- HST science justified vs Juno science (avoid redundancies with UVS)
- pending questions (timing, in situ instr., …)

HST proposal template

- Scientific Justification
- Description of the Observations
- Special Requirements
- Coordinated Observations
- Justify Duplications

HST Large GO proposal:

- HST orbits > 75
- Page limit for the text of the scientific justification = 6 (currently: 6!)
- Total page limit for PDF attachment incl. figures, tables, references = 11
  Full references do not count in total
- **Deadline for proposal submission (APT): April 8, 2016, 8PM EDT**


Solar avoidance
(forbidden: PJ0-PJ3)
HST campaign limited to C24
Possible (not recommended) PJ4-PJ7
HST Cycle 24
10/1/2016 – 9/30/2017
Opposition
(best view
from Earth: PJ14)
8 April 2017
Opposition +/- 2
Juno orbits
(ideal: PJ12-PJ16)
between
quadratures
(allowed:
PJ8-PJ20)
Jan – Jul 2017
Possible (not recommended)
PJ21-PJ23
Solar
avoidance
(forbidden:
PJ24-PJ32)
6-month overlap with
13 Juno orbits (PJ8-20)

Scientific Justification - Outline

"The main goal of the proposed HST program is to **substantially increase the science return of the Juno mission** by complementing the ultraviolet observations that will be obtained with the ultraviolet spectrograph (UVS) instrument."

1 UVS "ON"

- 1.1 Apojove
  - 12-hr monitoring of auroral activity (similar to EXCEED – HST campaign)
- 1.2 Perijove (UVS perijove segment ~6 hours)
  - 1.2.1 UVS limitations near perijove
  - 1.2.2 HST-STIS/Juno-UVS Complementary Science near Perijove
    - 1.2.2.1 Trans-hemispheric observations (use asymmetric mag field)
    - 1.2.2.2 Observations in the same hemisphere (X calib. + short T-scale obs.)
    - 1.2.2.3 HST-STIS observations of the moons auroras

2 UVS "OFF"

- 2.1 Current sheet crossings
  - Full description of main and secondary emissions + plasma injections
- 2.2 One Jovian rotation before and after the UVS perijove segment
  - Injections + volcanic/torus activity
- 2.3 Juno flying near southern auroral high-latitude magnetic field lines
  - Polar emissions (flares, swirl and dark regions)

Missing:

- HST-STIS MUV observation of PAH
  (insert 1sec NUV-MAMA image)
  OK if accepted by STScI (currently forbidden)

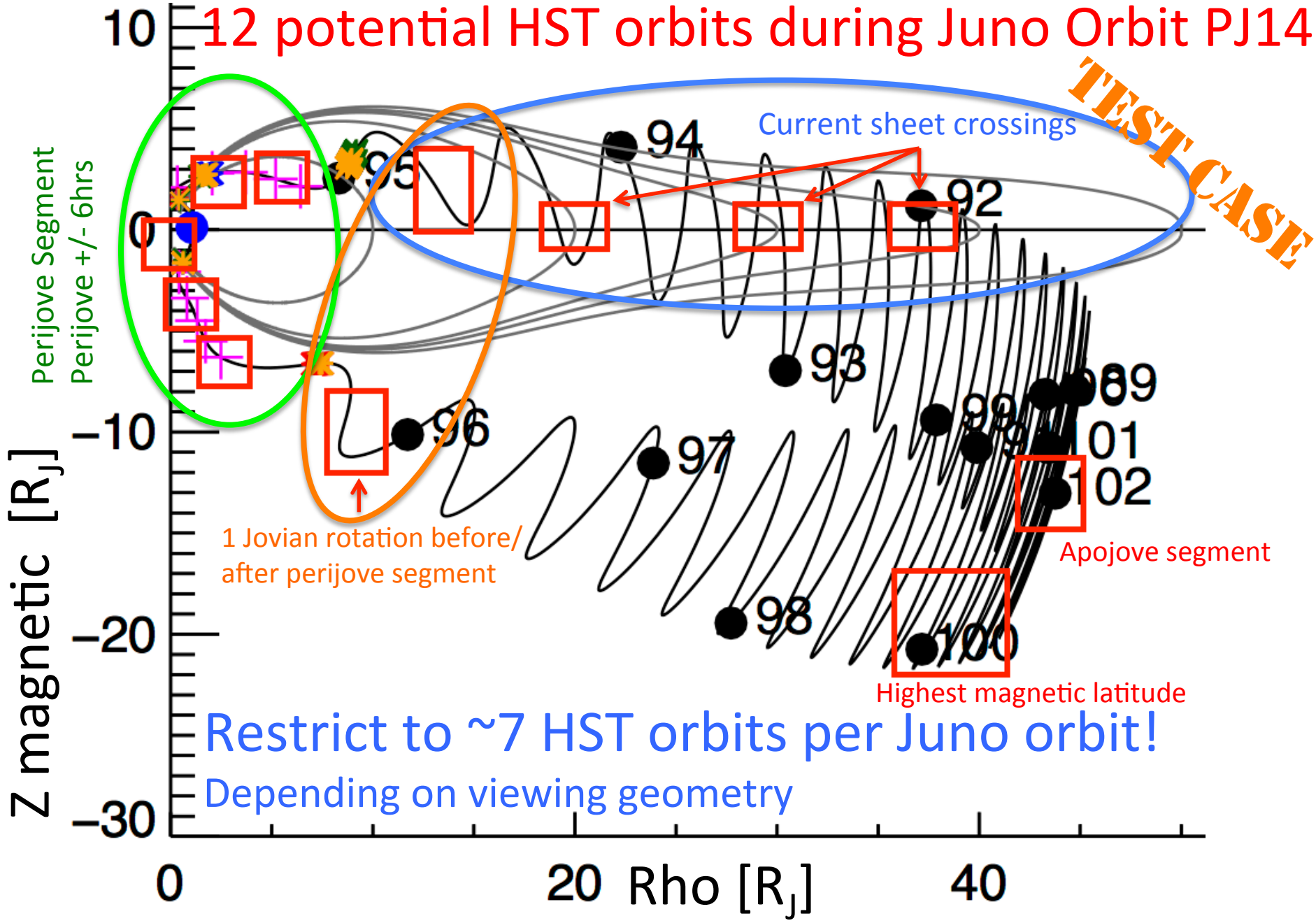
- Chandra X-ray parallel observations

Allocated CXO time:	72 ks	in Cycle 17	3 potential CXO slots during HST period: PJ11, 13, 20
	144 ks	in Cycle 18	
	72 ks	in Cycle 19	

- HISAKI

…

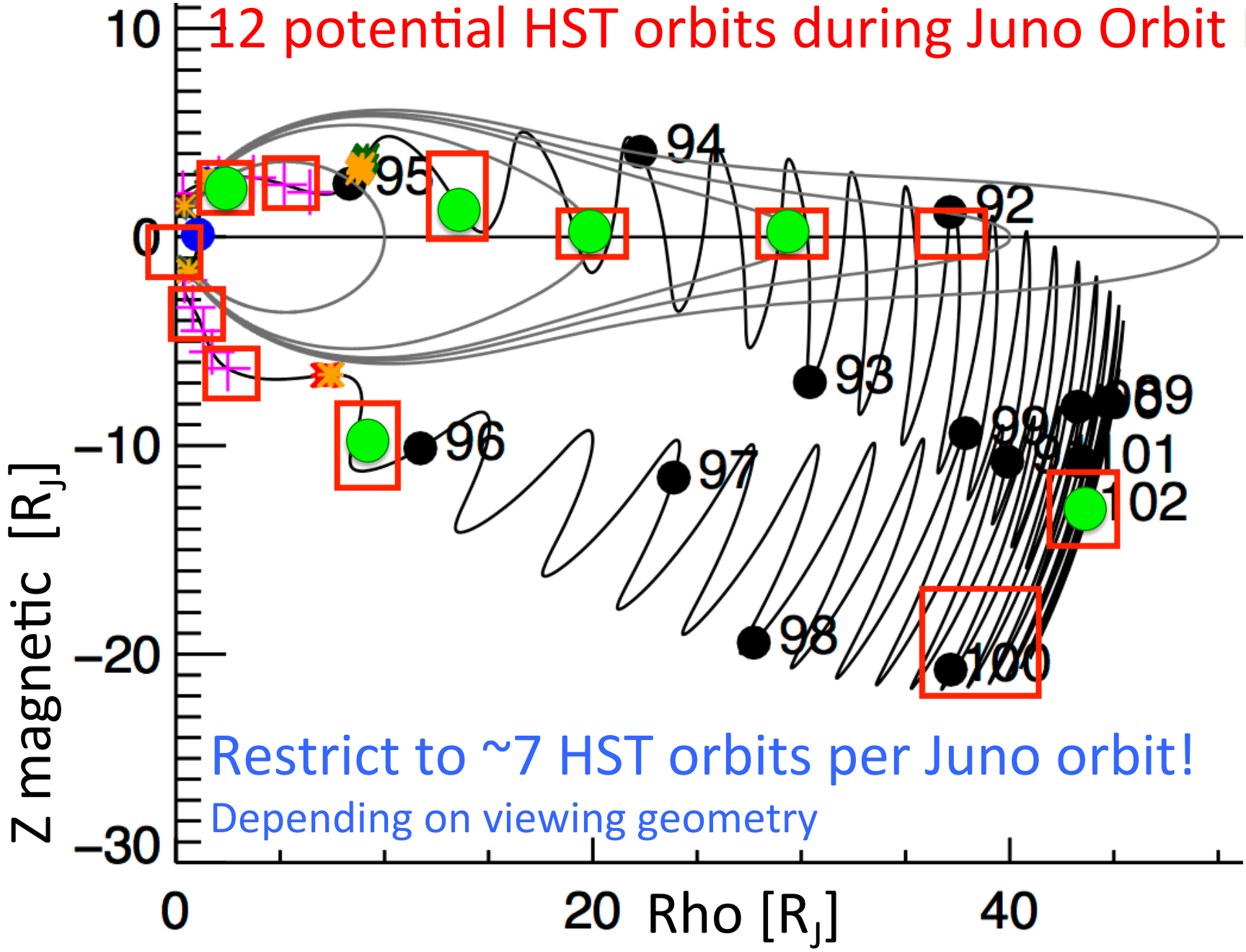
12 potential HST orbits during Juno Orbit PJ14



Restrict to ~7 HST orbits per Juno orbit!

Depending on viewing geometry

12 potential HST orbits during Juno Orbit PJ14

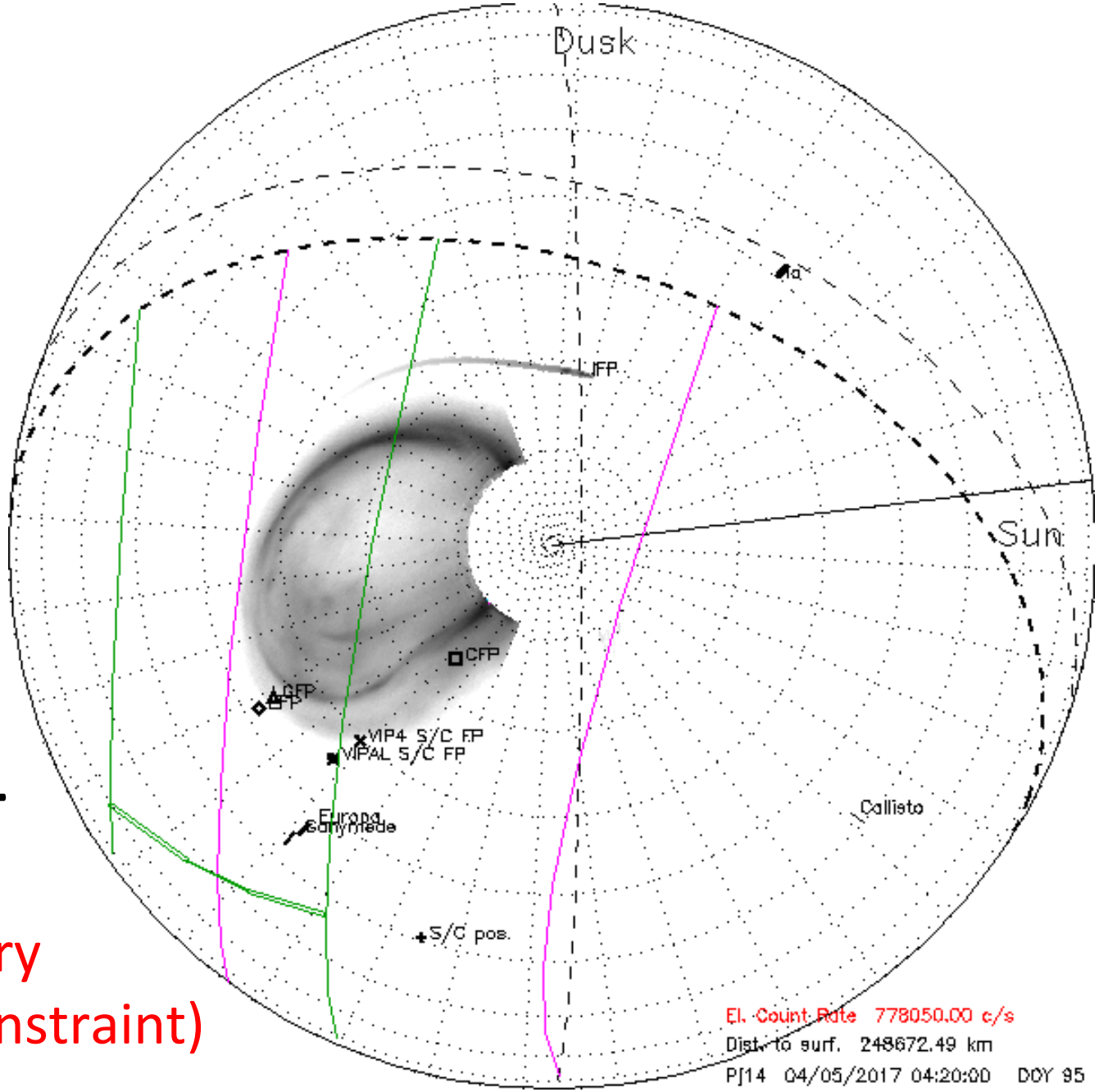


Restrict to ~7 HST orbits per Juno orbit!

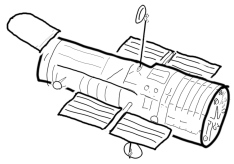
Depending on viewing geometry

PJ 14

Viewing Geometry (CML constraint)



HST



1-way LT
~40 min

Provide Table: Juno Orbit vs HST orbit (N=North, S=South)

				CXO		CXO							CXO
	PJ8	PJ9	PJ10	PJ11	PJ12	PJ13	PJ14	PJ15	PJ16	PJ17	PJ18	PJ19	PJ20
					Moons Auroras								
1						N	N						
2						S	NSN						
3							S						
4													
5													
6						S	N						
7						N	S						
8							N						
9						N	N						
10													
11						S							
12							N						
Moons										Eu, Ga			
Total						5	8			4			

Perijove Segment

1 Jovian orbit before/after

C-S Xings

High latitude

Apojove Segment

Keep the "details" for Phase II

Pending Questions

- Are JADE and JEDI observing during each current sheet xing (a dozen per Juno orbit)?
- What kind of information can we derive from Low-Res JADE and JEDI monitoring? Sufficient for auroral science (e.g. high latitude HST orbit)?
- JADE and JEDI really always "On"?
- Include MAG and WAVES in HST science justification? (might need some help, but already reached page limit)
- UVS observing continuously during perijove segment or sliced by telemetry, S/C memory and Dark noise?
- Length of typical UVS uninterrupted seq.? ~10 min?
- Include MUV observations of stratospheric haze (white paper)?
- Assume simultaneous HISAKI observations (Kimura)?
- Max number of Co-Is (<20), Supporters?
- Need support letter from Mission PI!
- …

Thank you for your help!

HST MUV White Paper

Polar stratospheric haze
Heavy hydrocarbons
Polycyclic Aromatic Hydrocarbons

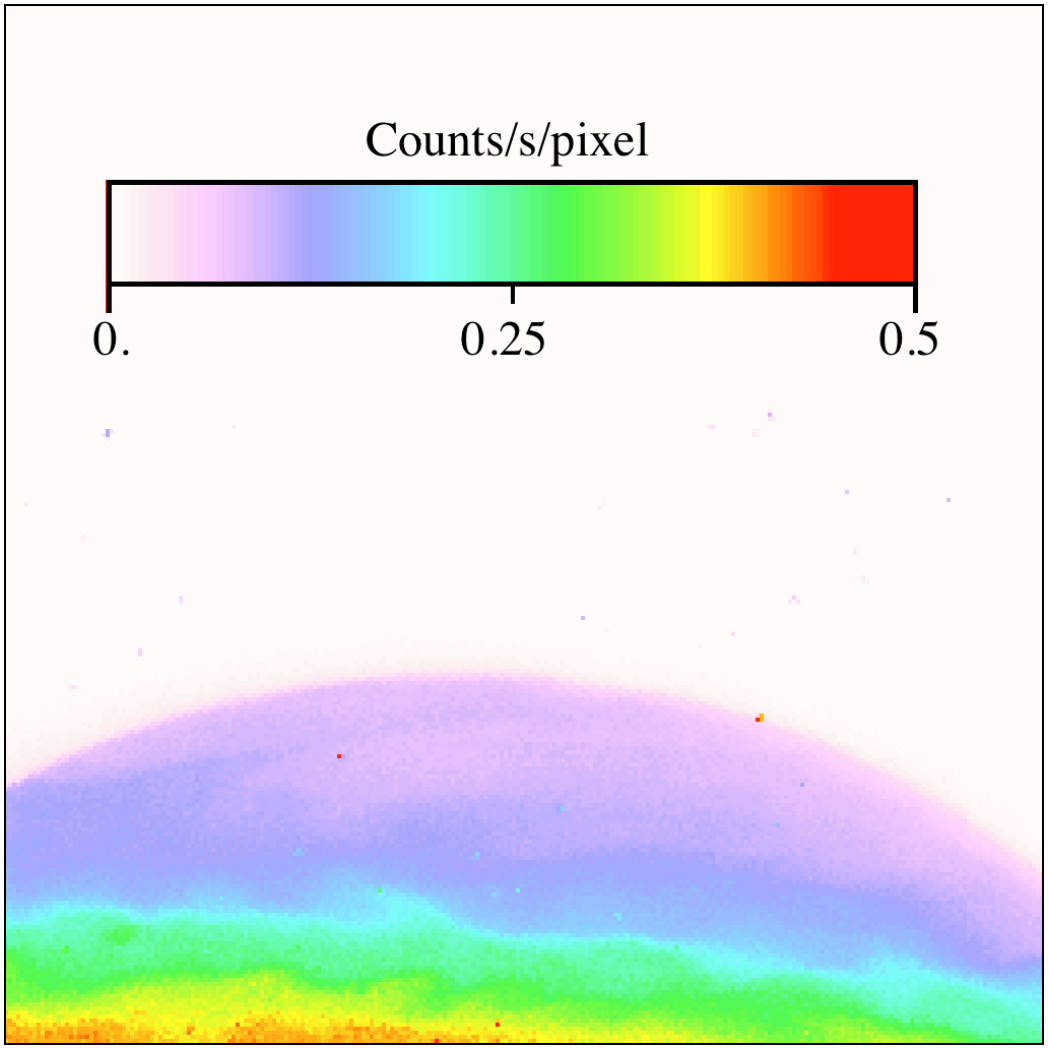


Figure 1: Simulated STIS NUV-MAMA image of Jupiter's northern polar region obtained by scaling an existing WFPC2 (WF3) image. The color table provides adjusted count rates in counts per sec per STIS pixel. The image illustrates the large absorption of MUV light by stratospheric haze in the polar region that makes it possible to safely observe this part of Jupiter's MUV disk. It also shows the stratospheric haze structures (hues of violet) that might be associated with auroral precipitation. In this simulated image, the global count rate is 61,121 counts.s^{-1}; that is 3.3 times lower than the screening global limit. (Bright dots are traces of WFPC2 cosmic rays).