

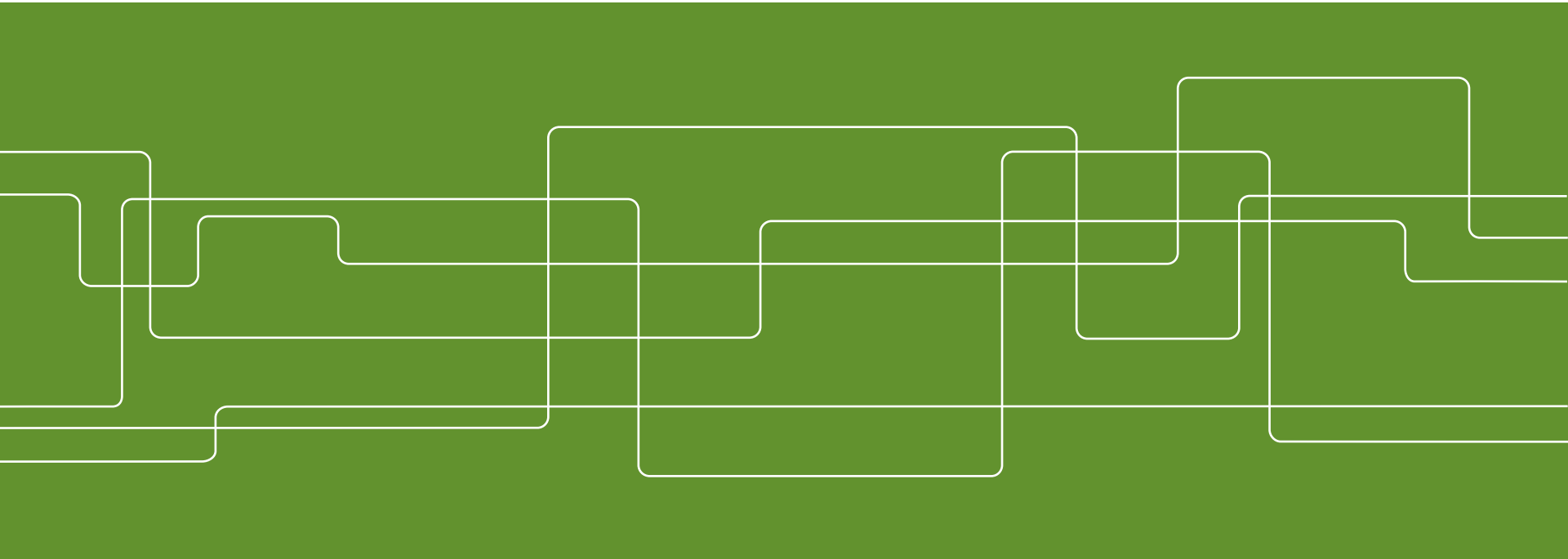


Jupiter stray light background measurements for future Europa STIS observations

GO/DD 15371

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GO/DD 15371

- Goal: Characterize the STIS/CCD background in the G230MB and G750M modes within 1 arc minutes of Jupiter.
- Both modes can be used to search for auroral emission from dissociation of H₂O and thus for plumes on Europa
- Sensitivity to H₂O critically depends on instrument and Jupiter straylight noise
- Observations of noise level in dark sky with both modes and both square 2"x2" aperture and 52"x2" long slit at different offsets to Jupiter (Europa not in field-of-view).



Summary

- H-alpha and OI aurora likely detectable above straylight background in STIS G750M observations
- Dispersed aurora from OH band unlikely to be detectable due to detector noise in STIS G230MB observations
- Comparing the two tested modes: G750M mode preferable over G230MB mode for plume searches
- More details on next slides

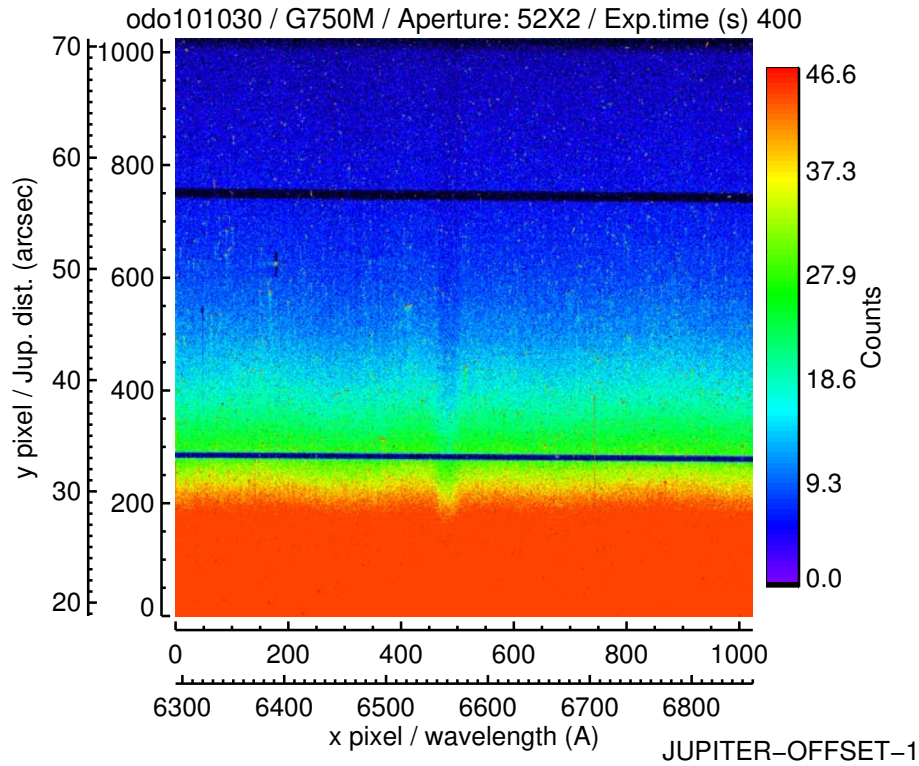


Visible G750M images

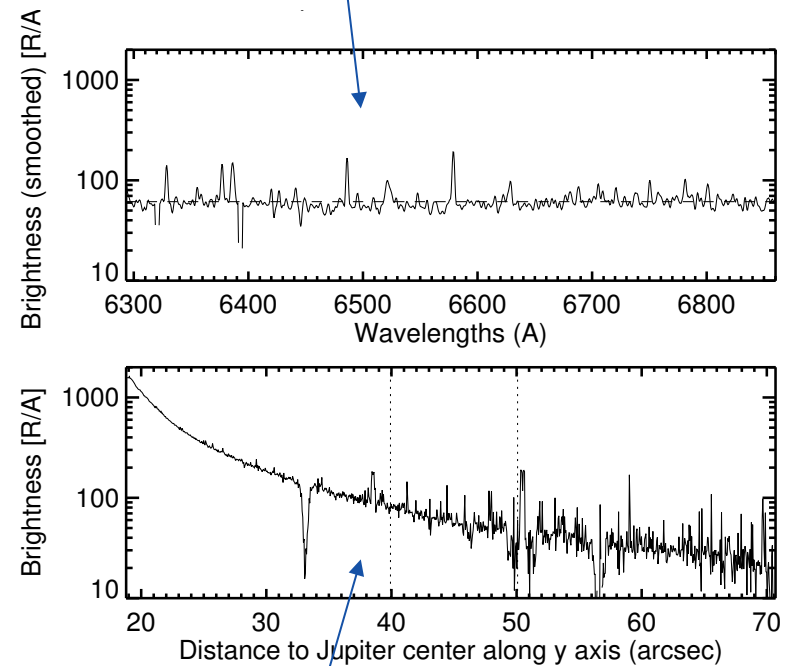
- Straylight background present in all exposures
 - Straylight dominant - FOV trace in 2"x2" images much brighter than other areas
 - Brightness decreases with increasing distance to Jupiter
 - Spectral brightness is 200 R/Å at an approximate angular separation of Europa to Jupiter of 30", as roughly during eclipse observations
 - Straylight similar to expected level based on previous Io eclipse observations (Trafton et al., Icarus, 2012)
- H-alpha and OI aurora likely detectable above noise background

STIS/CCD G750M - 52"x2"

Raw detector image



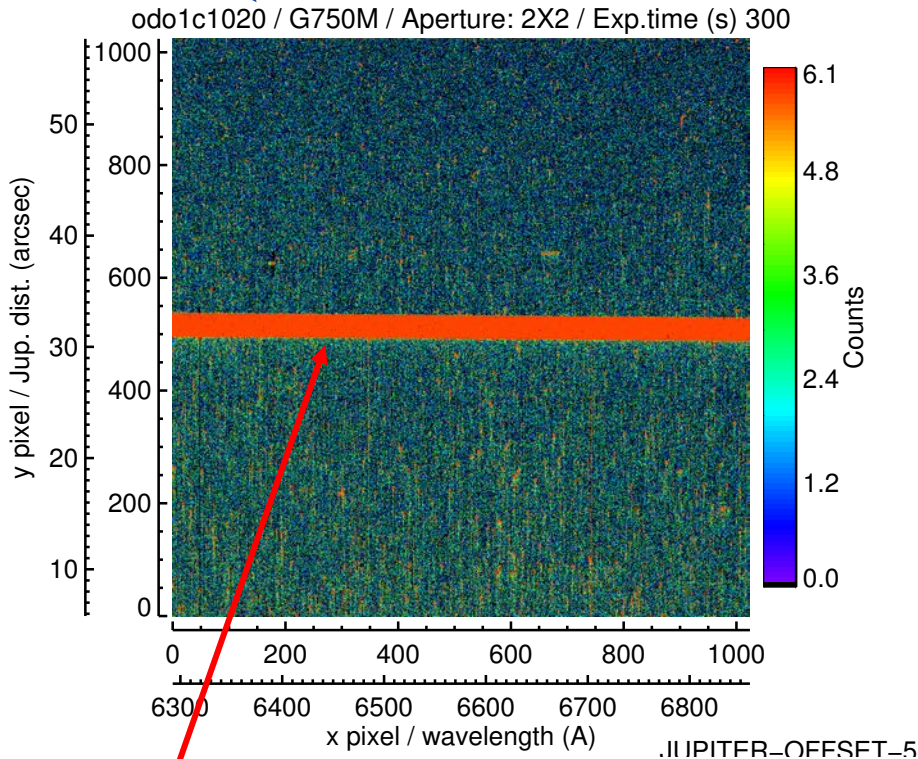
Spectral trace along x axis around y pixel ~ 500



Spatial profile along slit (along y axis)

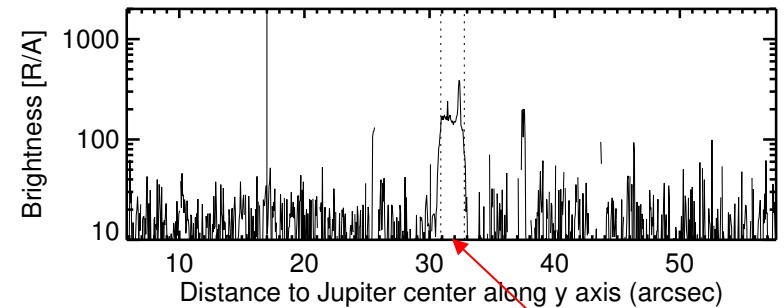
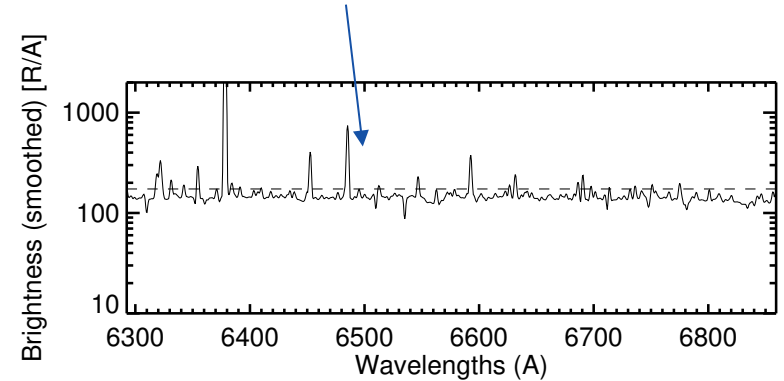
STIS/CCD G750M 2"x2"

Raw detector image



Spectral trace of 2"x2 aperture / field-of-view

Spectral trace along x axis within 2"x2 aperture



2"x2" aperture section

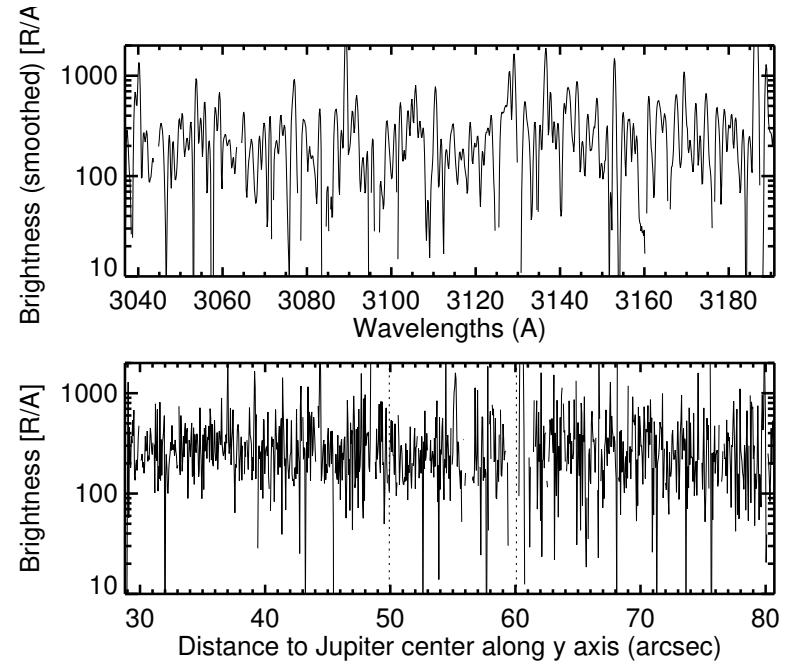
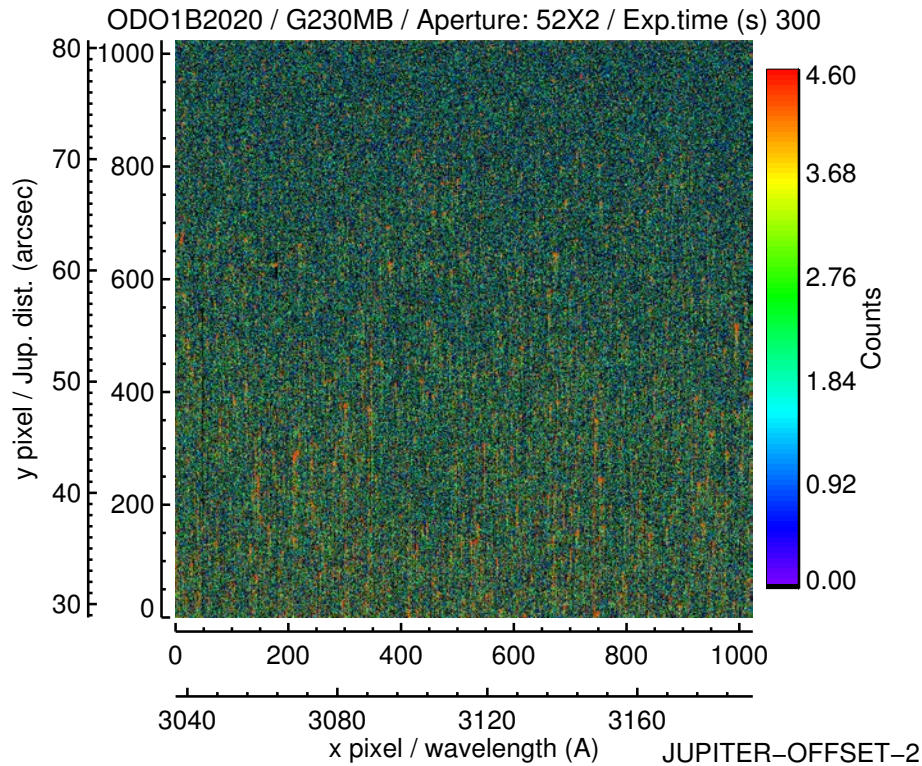
Spatial profile along slit (along y axis)



NUV G230MB images

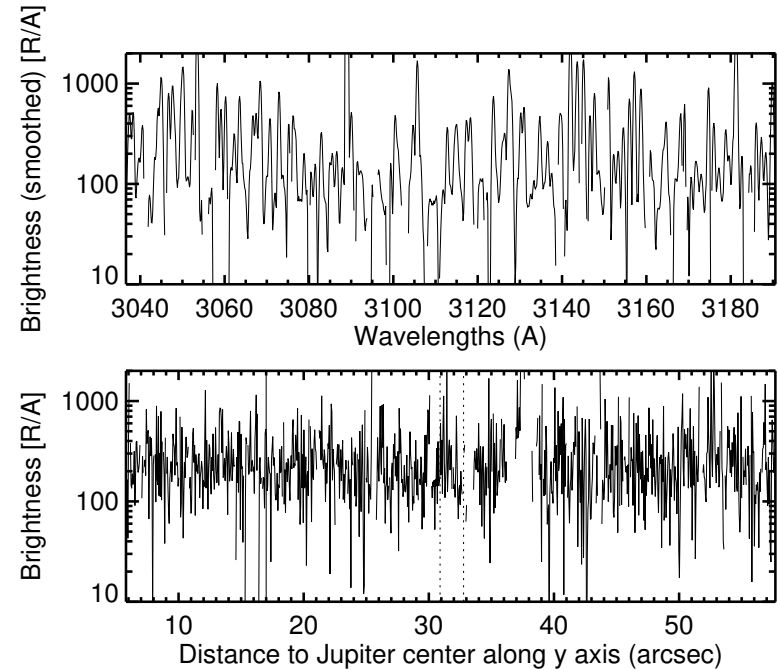
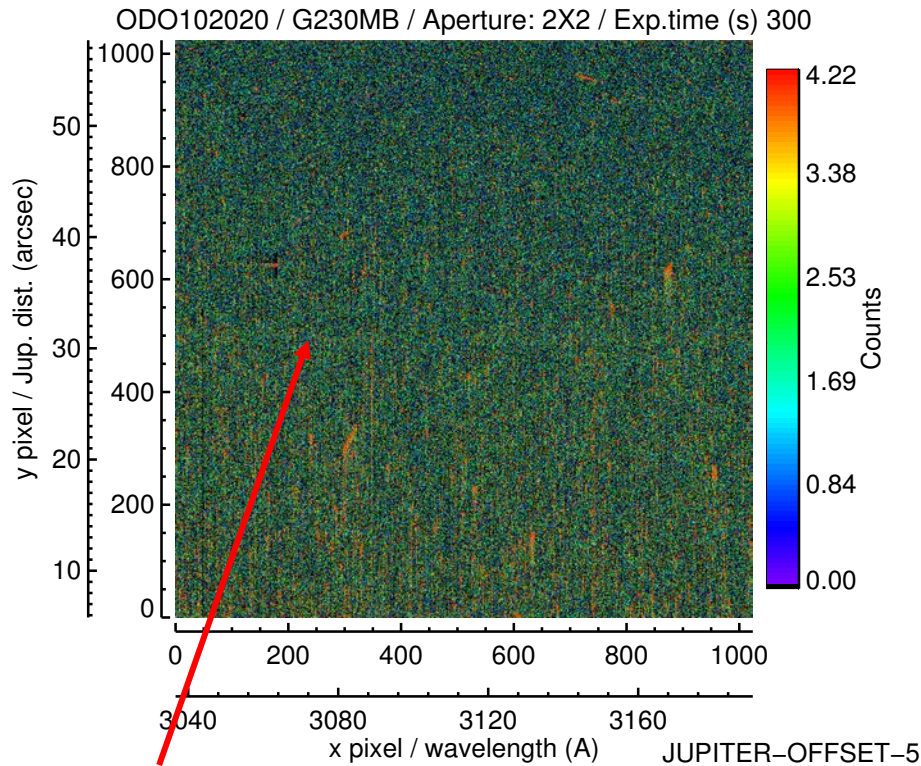
- Signal dominated by detector noise
 - No dependency of the noise level to Jupiter distance in the 52"x2" images
 - FOV trace along x in 2"x"2 images is not or hardly distinguishable/visible
 - The estimated aurora OH band brightness is 15 R/Å, which will be hardly detectable
 - Total noise level similarly high as for G750M images.
- Dispersed aurora from OH band unlikely to be detectable

STIS/CCD G230MB 52"x2"



No trend along y / with distance to Jupiter

STIS/CCD G230MB 2"x2" (square aperture)



Spectral trace of 2"x2
aperture / field-of-view
NOT / HARDLY visible!



All exposures

STIS/CCD G750M

- 4 exposures with 2"x2" square slit:
 - 2 with 22" offset and 20 s / 300 s exposure time
 - 2 with 32" offset and 20 s / 300 s
- 6 exposures with 52"x2" long slit pointing away from Jupiter:
 - 3 from of ~20" to ~70" offset, 10 s / 100 s / 300 s
 - 3 from of ~30" to ~80" offset, 10 s / 100 s / 300 s

STIS/CCD G230MB

- 4 exposures with 2"x2" square slit:
 - 2 with 32" offset and 20 s & 300 s exp time
 - 2 with 47" offset and 20 s & 300 s exp time
- 2 exposures with 52"x2" long slit pointing away from Jupiter covering distances of ~30" to ~80", 20 s / 300 s