
PACE OCI Straylight and Crosstalk Evaluation using Moon

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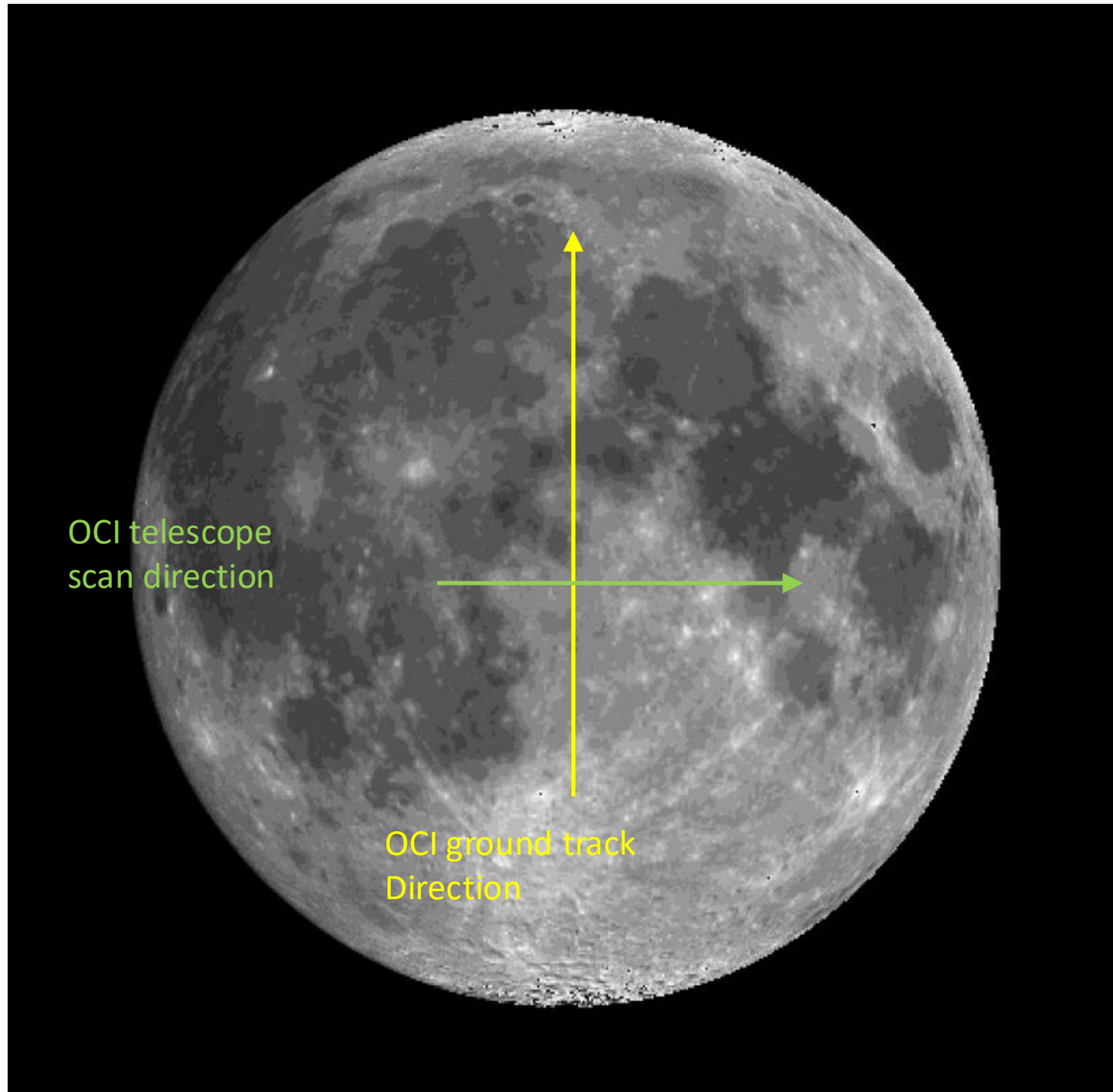
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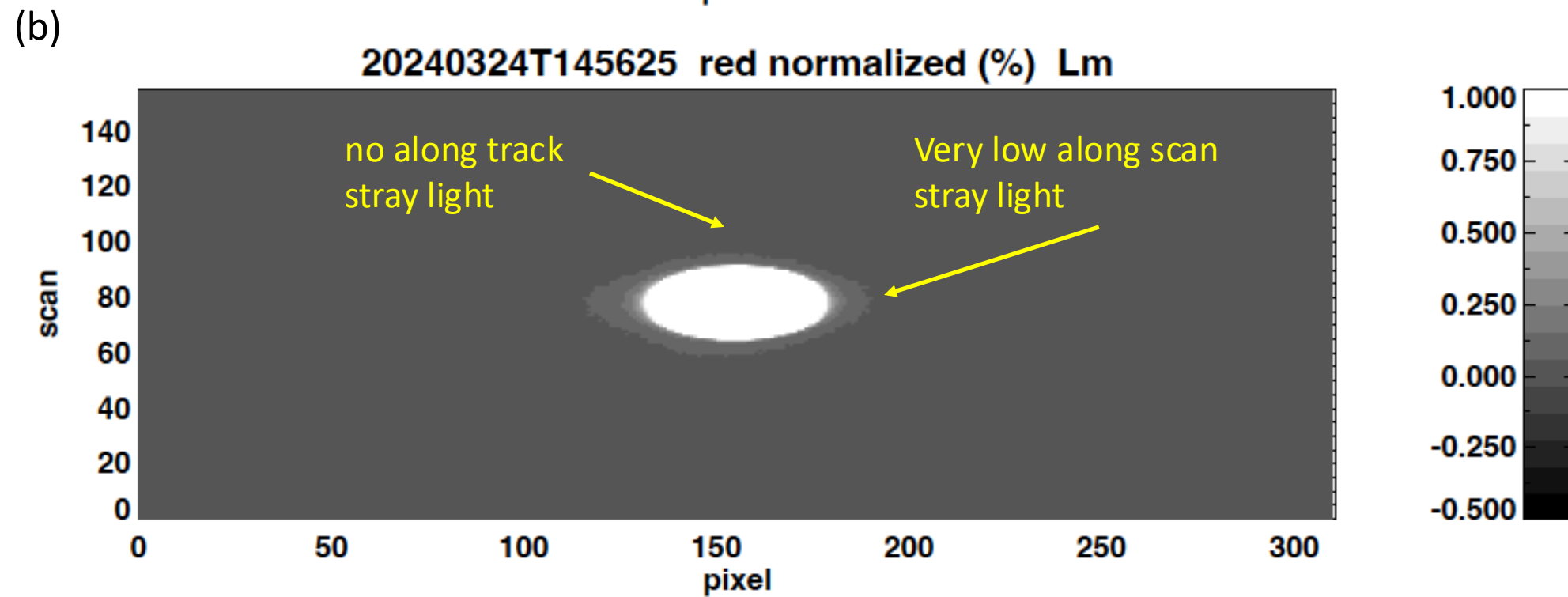
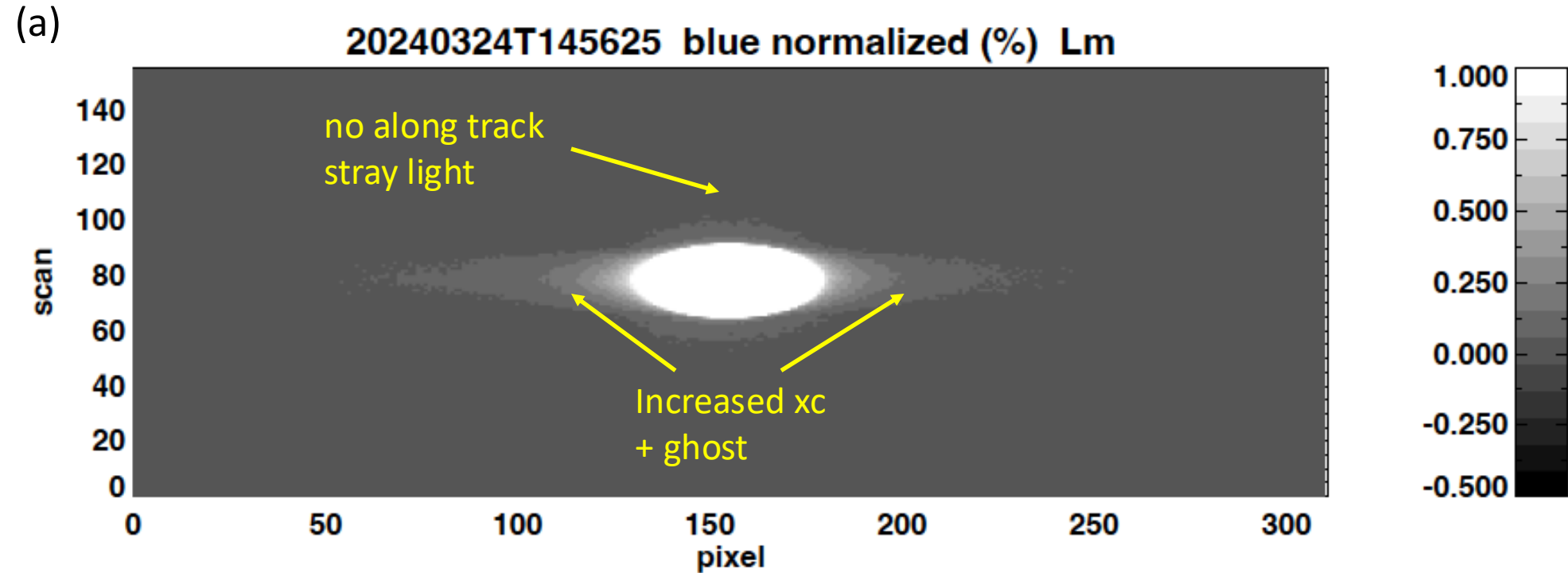
**SPIE Asian Remote Sensing, Kao-Hsiung, Taiwan
December 3, 2024**

OCI Lunar Observation



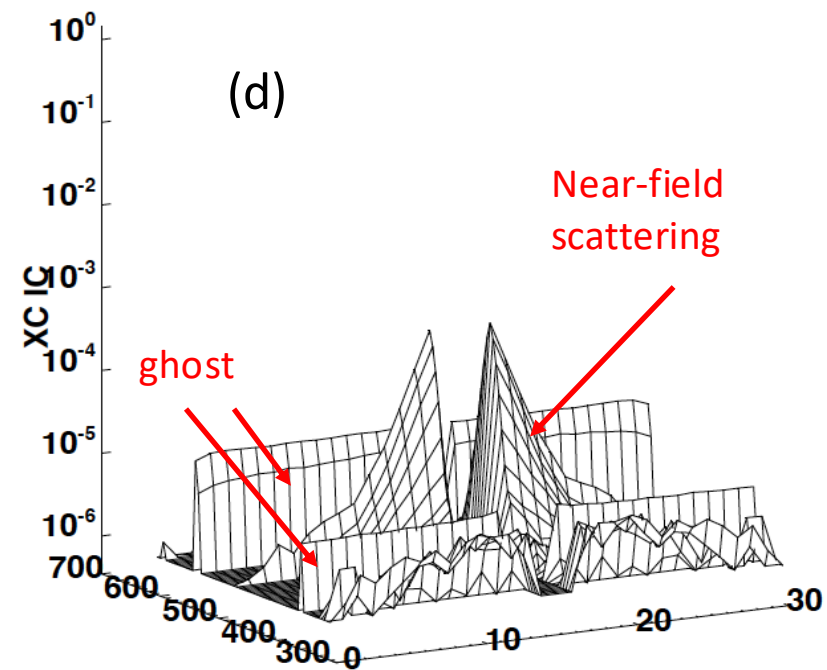
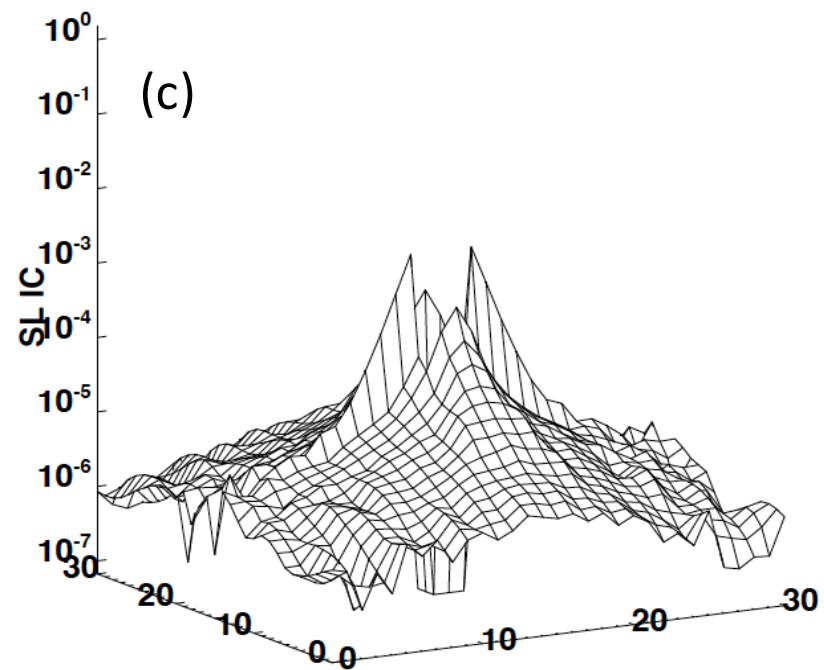
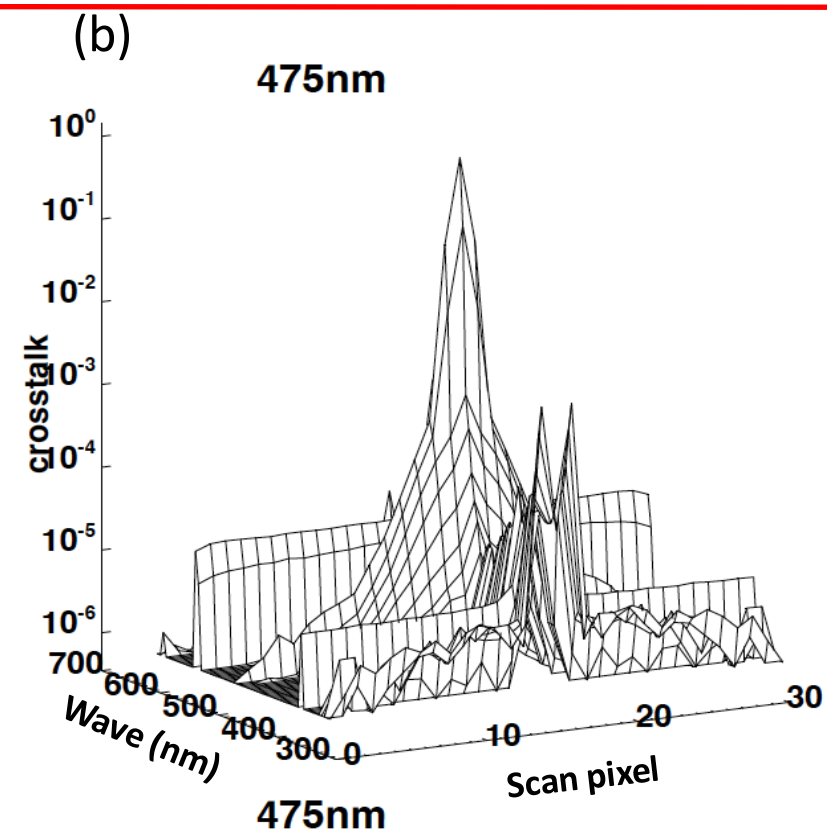
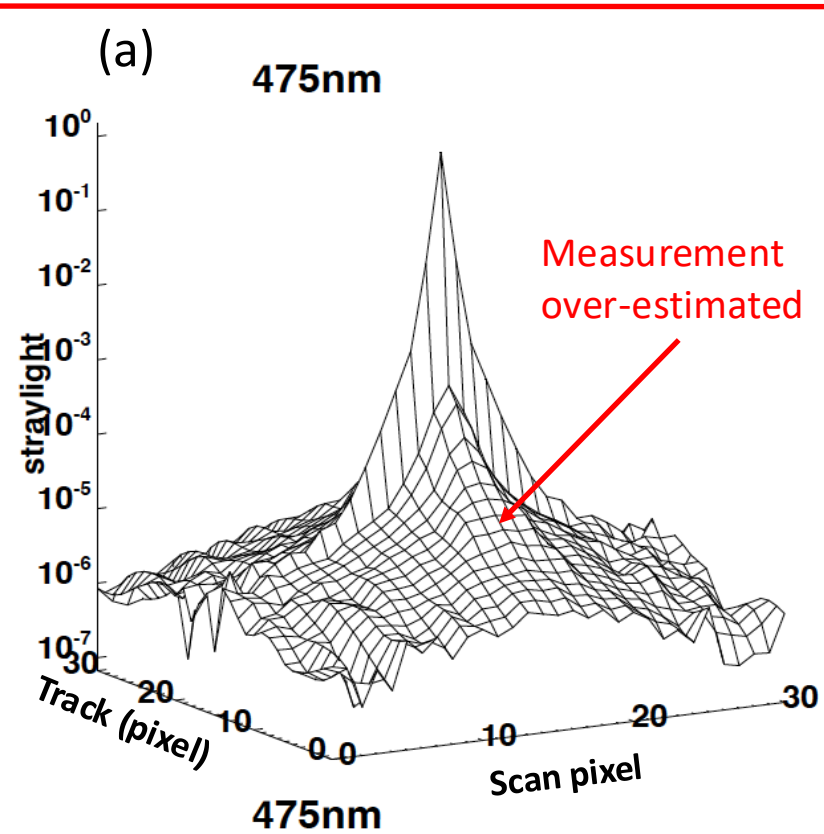
- Moon as an extended source for straylight/crosstalk analysis.
 - showing 7 degree phase angle results
- OCI lunar observation
 - Moon @ 30 degree scan angle.
 - Along track: OCI sweep rate $\sim \frac{1}{4}$ science pixel per scan (4x over-sampling)
 - Along scan: 1x8 agg mode, GSD = 1/8 science pixel

OCI lunar images



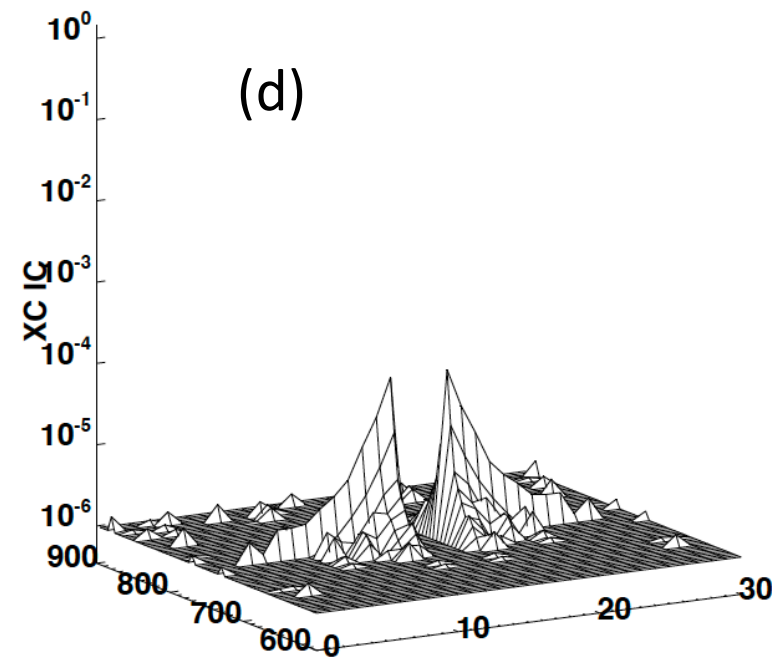
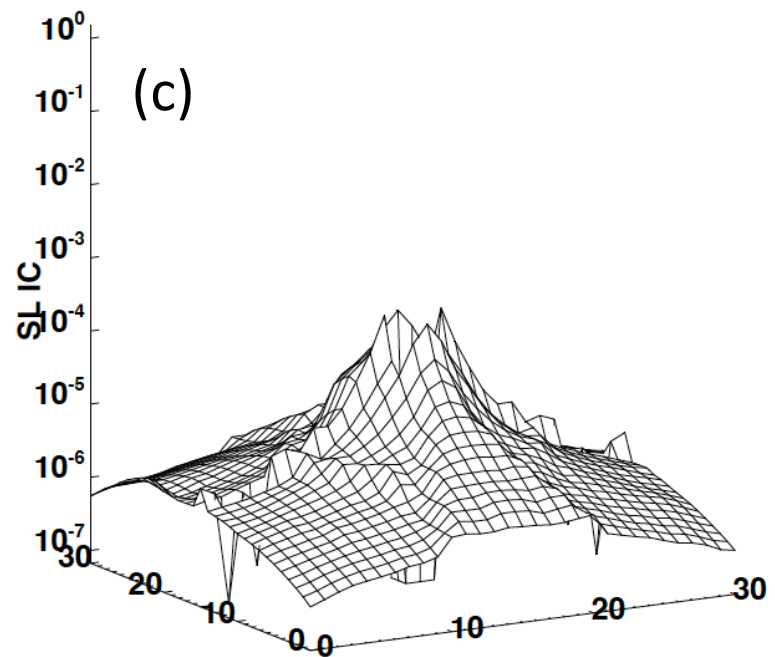
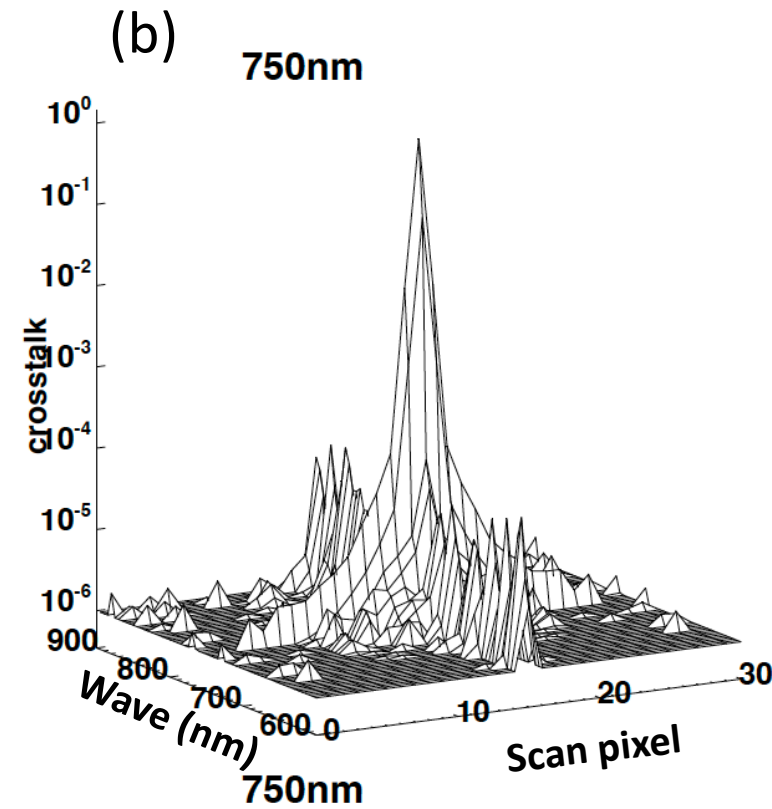
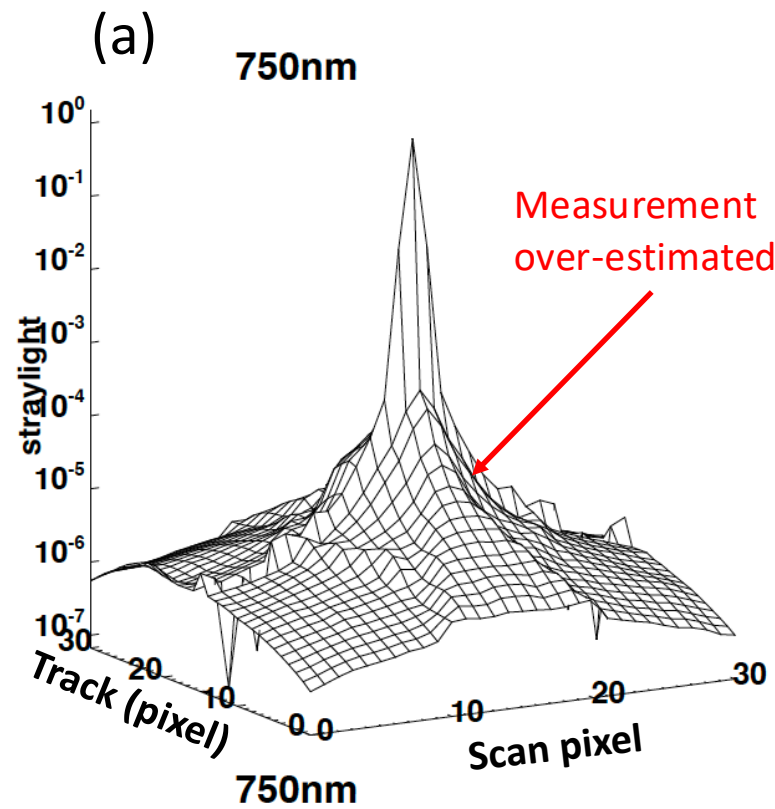
- Normalized focal plane assembly (FPA) averaged response
 - stretch (-0.5 to 1 %) to enhance crosstalk.
- blue:
 - No along track
 - some along scan straylight/crosstalk
- red:
 - no along track
 - Very low along scan

Prelaunch Measurements: Blue Bands



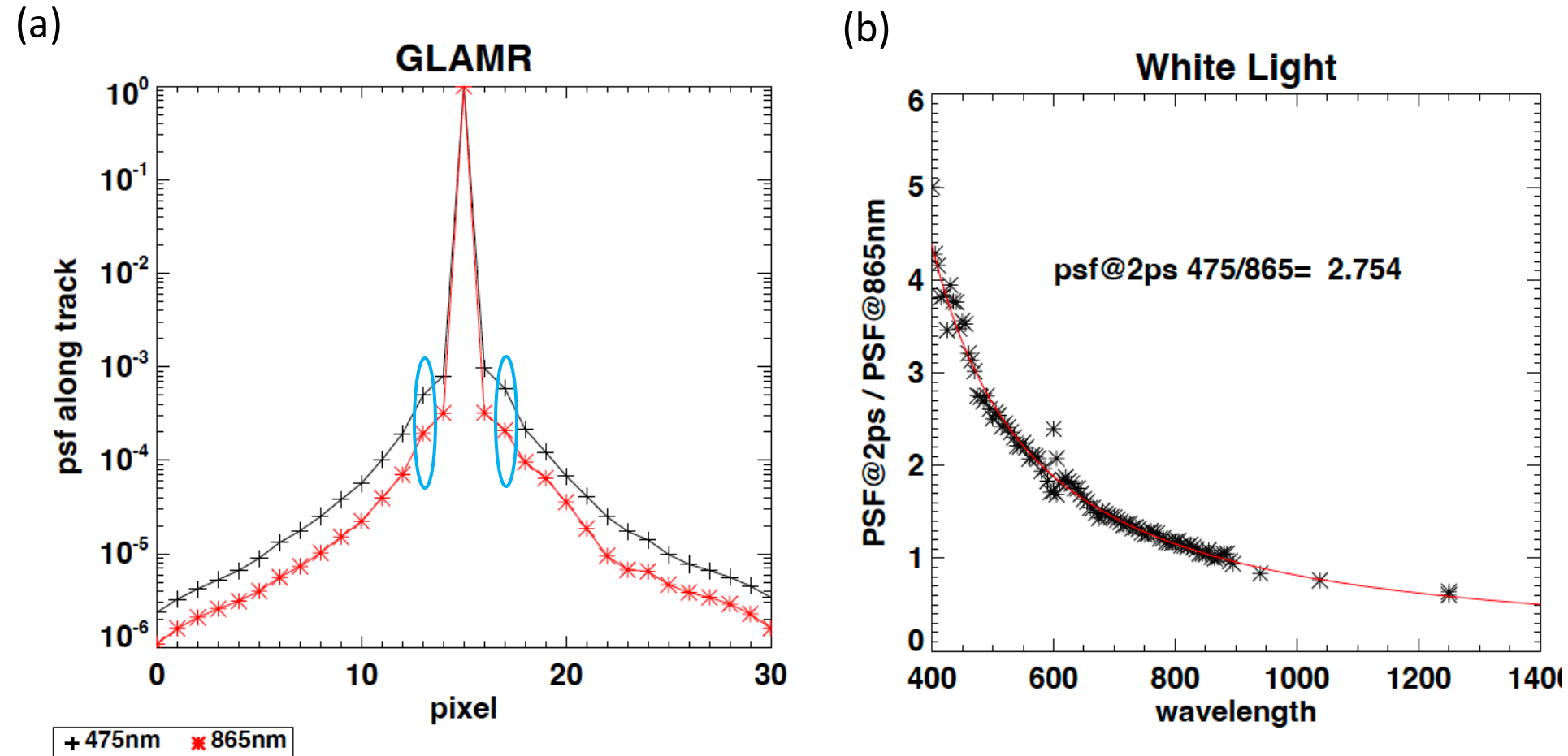
- OCI 475 nm band, straylight and crosstalk characterized prelaunch
- (a, b) characterized straylight and crosstalk.
- (c, d) straylight and crosstalk influence coefficients (IC) used in correction.
- lunar observation vs. prelaunch:
- Along track: measurement over-estimated
- Along scan: long tail caused by ghost

Prelaunch Measurements: red Bands



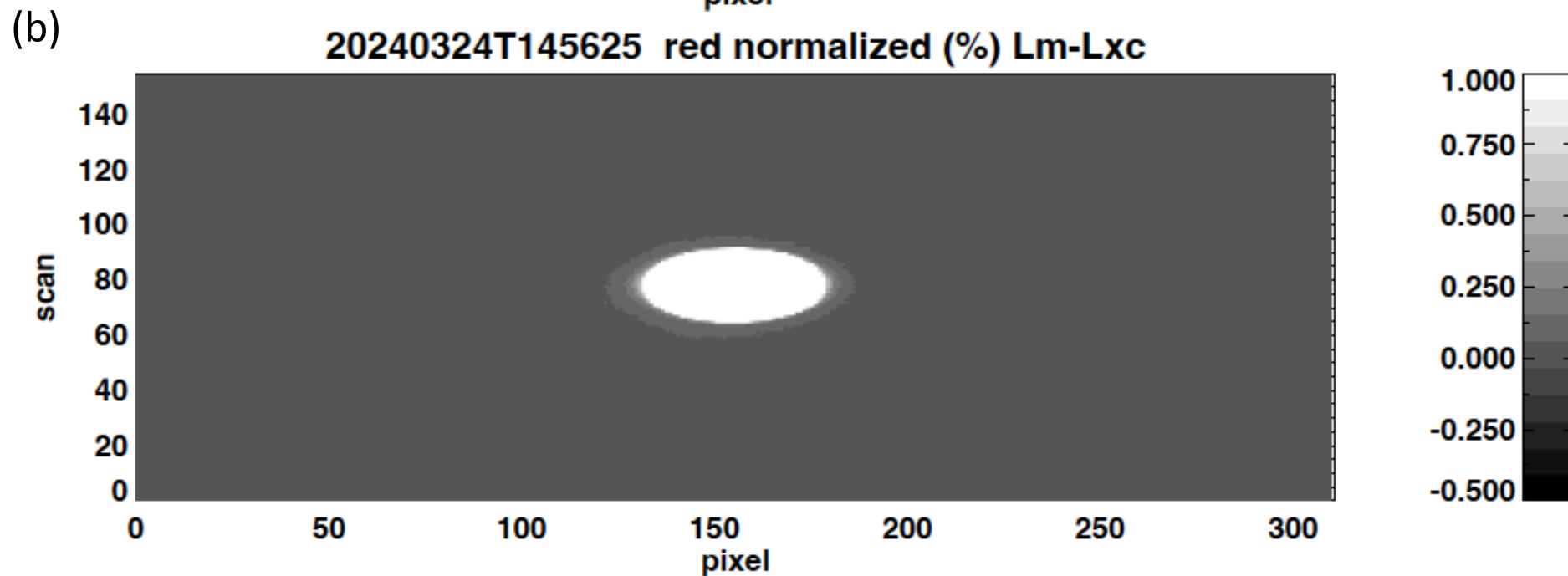
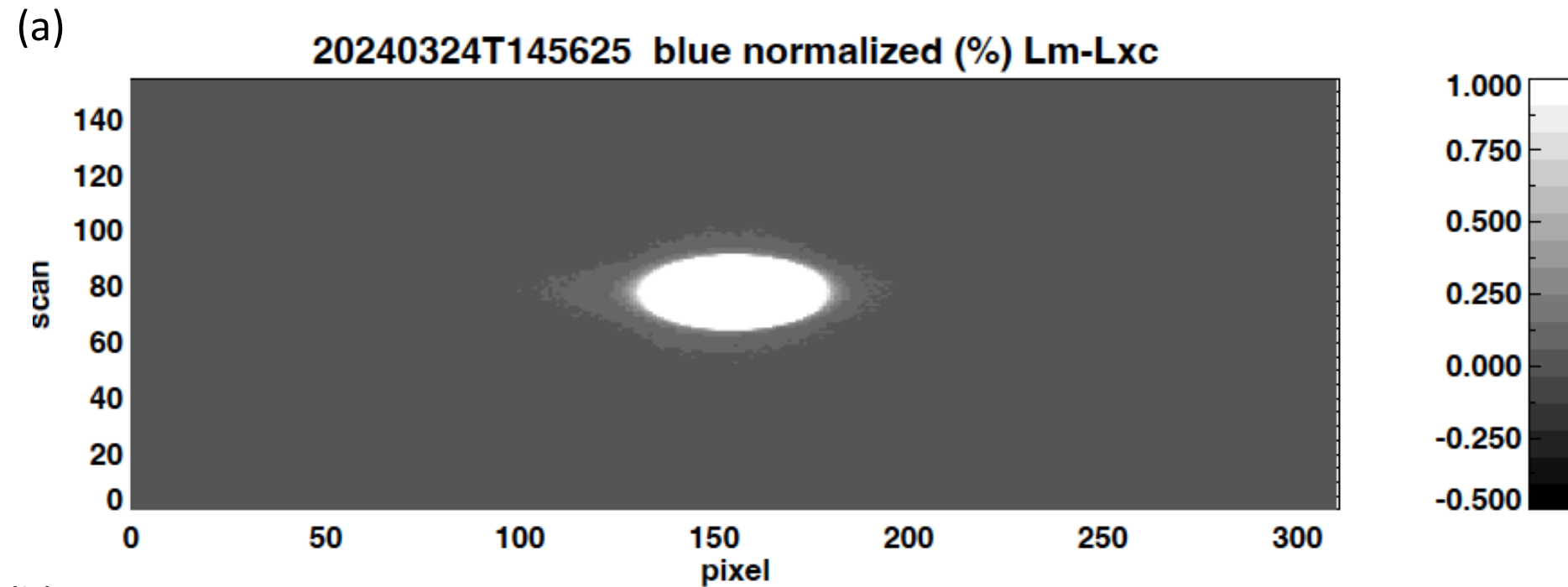
- OCI 750 nm band, straylight and crosstalk characterized by prelaunch measurements
- (a, b) characterized straylight and crosstalk.
- (c, d) straylight and crosstalk influence coefficients (IC) used in correction.
- lunar observation vs. prelaunch:
- Along track: measurement over-estimated
- Along scan: much lower than blue bands (no ghost, tail in the image)

Prelaunch: GSE contamination



- (a) OCI 475 nm and 865 nm band along track PSF
 - Was used for along track straylight mapping
 - Measurement mostly from ground system equipment (GSE) straylight
- (b) OCI band relative PSF (2 pixels from the peak) vs. wavelength.
 - GSE straylight spectral dependency

Crosstalk Correction: update & results



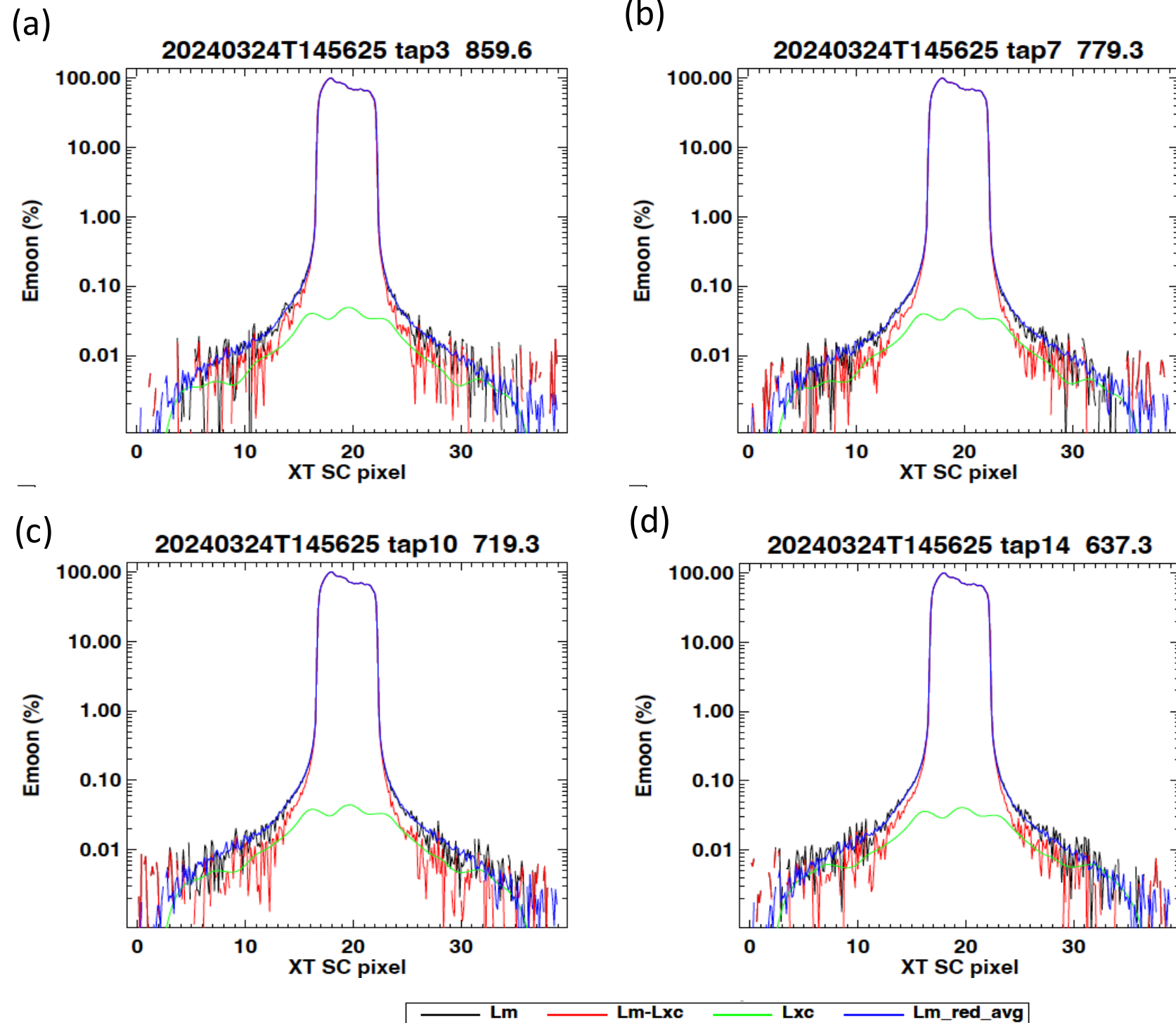
- **Update:**

- Remove along track straylight correction
- Reduce crosstalk IC based on lunar measurements and the GSE straylight spectral relationship
- No crosstalk correction for red bands

- **Goal:**

- Consistent residual after correction across bands
- Avoid over-correction (negative values)

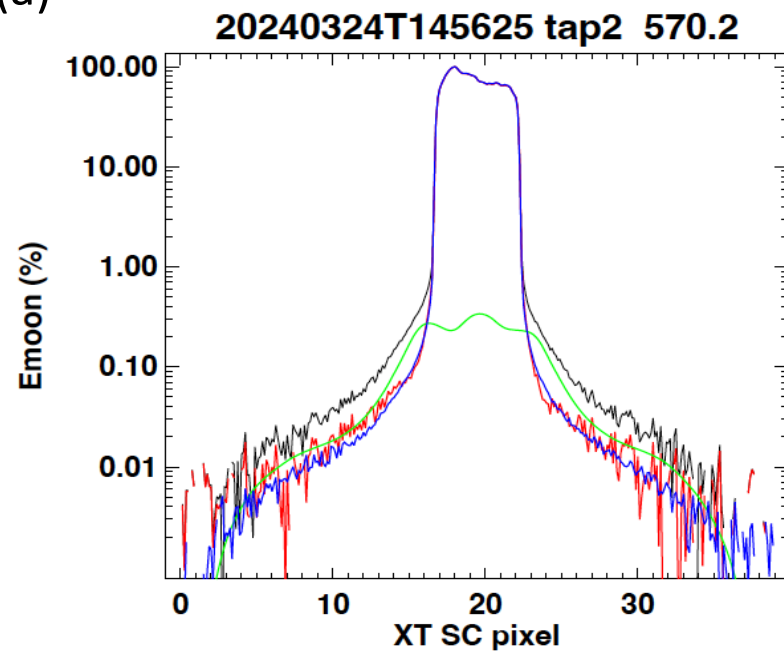
Crosstalk Correction: red bands results



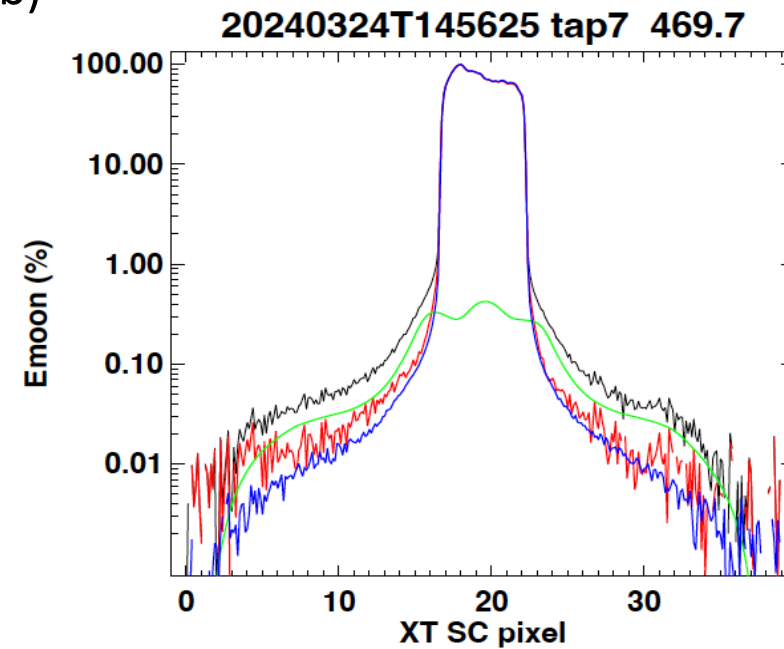
- Red CCD tap averaged response: 20nm wide super-band
 - Black: measured
 - Red: corrected
 - Green: xc correction
 - Blue: red FPA avg
- Along scan lunar profiles:
 - Very low straylight
 - tap vs. FPA averaged: small variation among bands:
- No correction applied:
 - very small correction

Crosstalk Correction: blue bands results

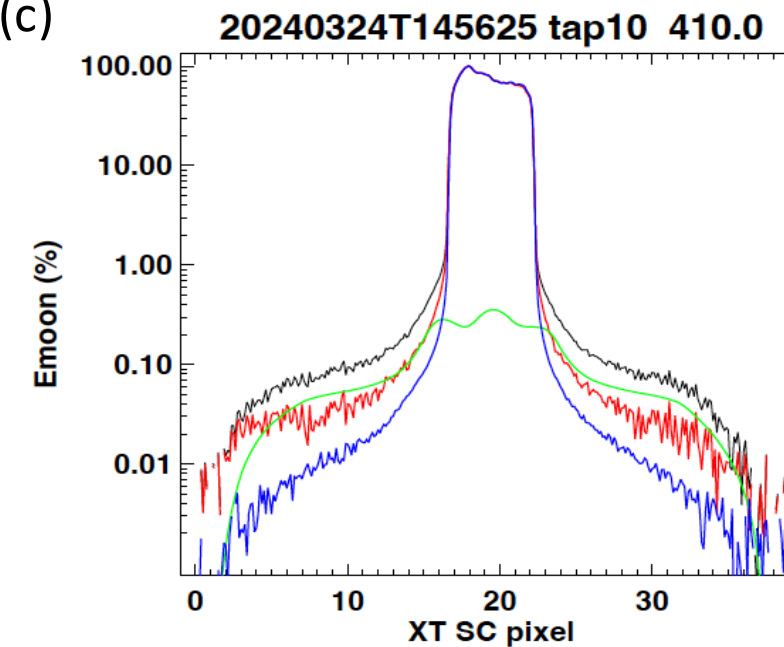
(a)



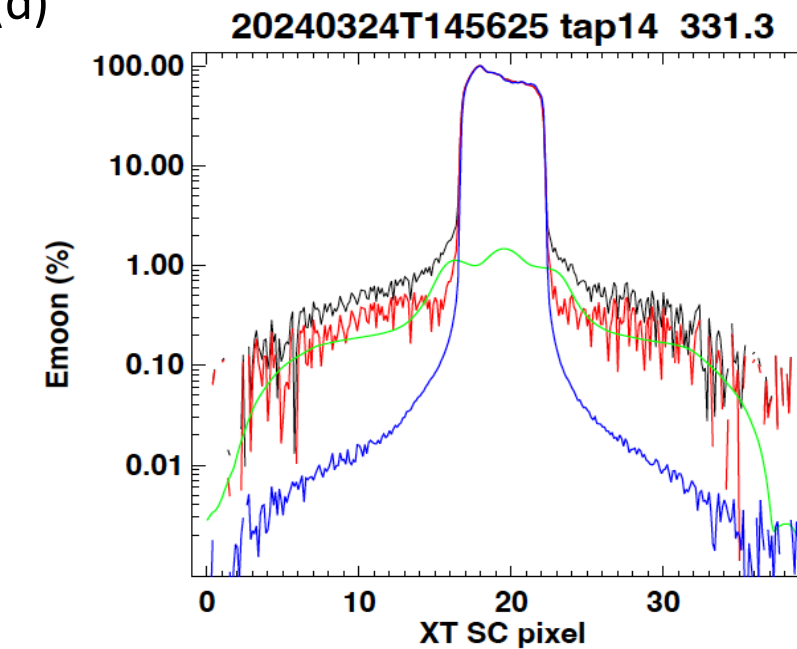
(b)



(c)



(d)

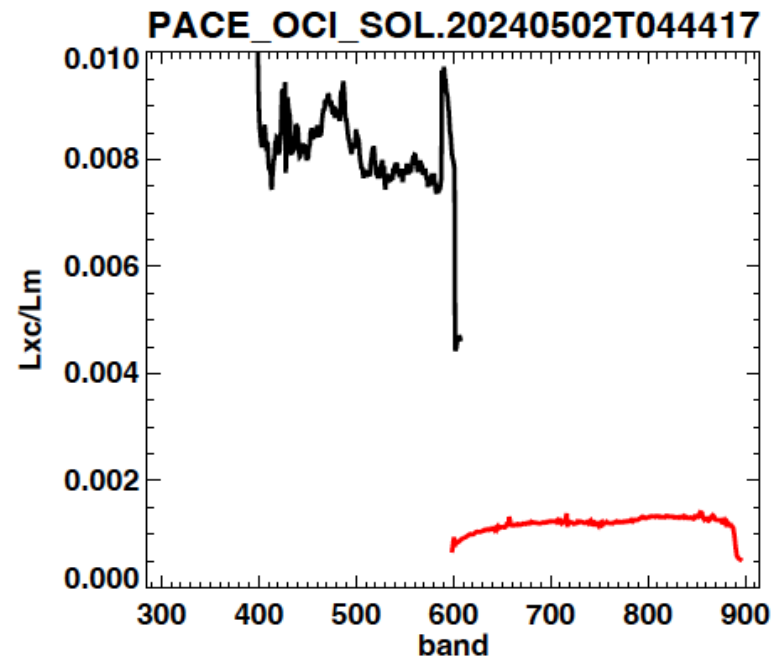


— Lm — Lm-Lxc — Lxc — Lm_red_avg

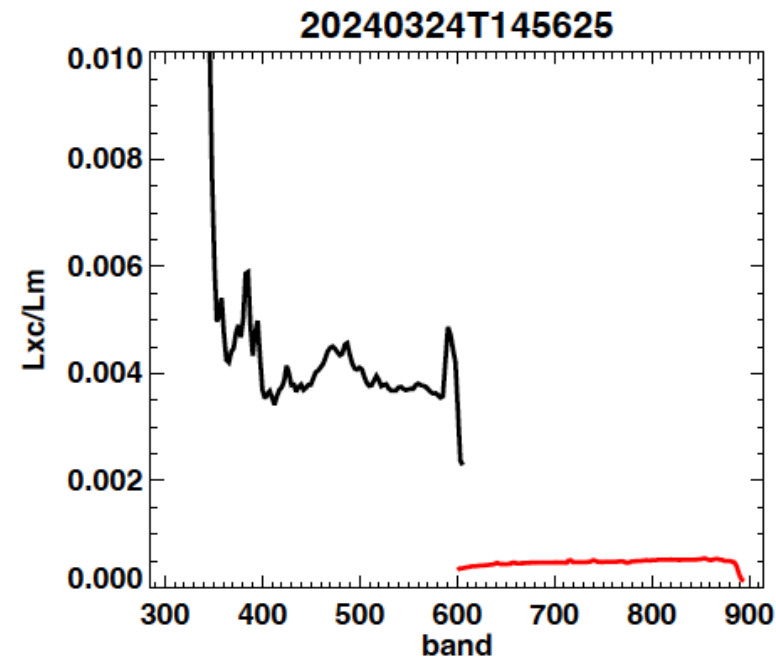
- Red CCD tap averaged response: 20nm wide super-band
 - Black: measured
 - Red: corrected
 - Green: xc correction
 - Blue: red FPA avg
- Along scan lunar profiles:
 - Crosstalk increased toward shorter wavelength
 - Corrected profiles matched red bands in green bands and deviate toward shorter wavelength.
 - Under-correction (ghost) in UV bands

Calibration impact

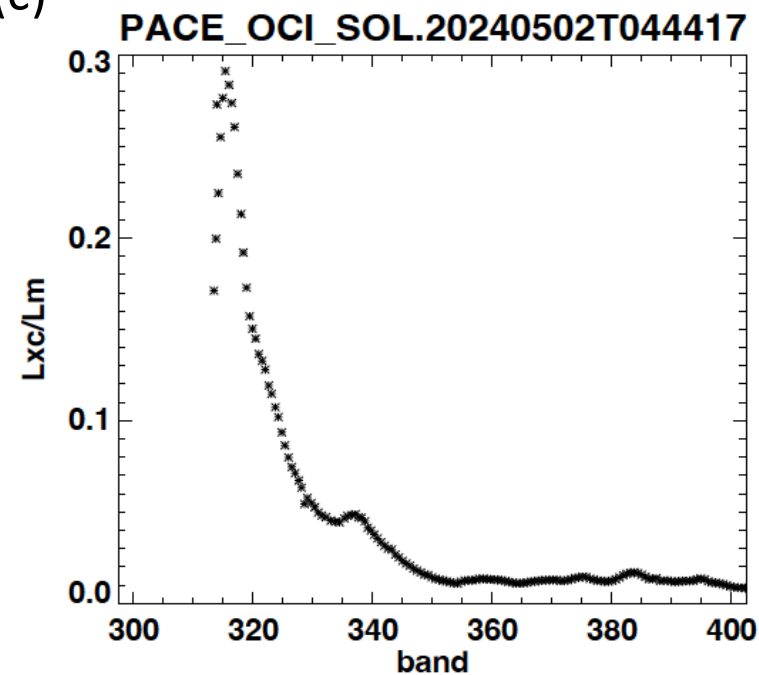
(a)



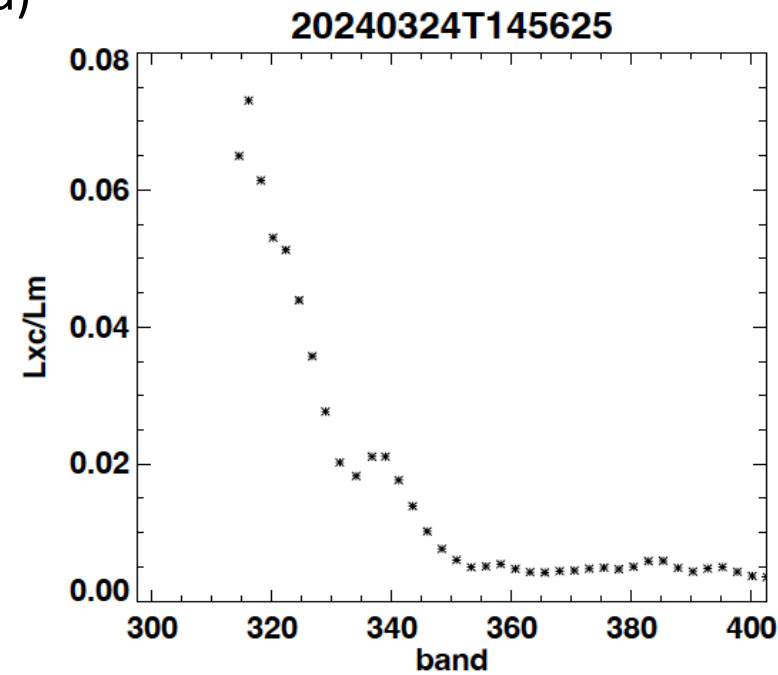
(b)



(c)



(d)



- Crosstalk correction vs. measured radiance
 - Left: SD
 - Right: moon
- *Crosstalk correction:*
 - Scene dependent
 - Solar-cal vs. scene
 - Change in calibrated radiances are scene dependent
- Moon vs. SD:
 - ~0.4% change 400-600 nm bands
 - Up to 20% change for UV bands
- Science data:
 - Evaluation on-going

Summary

- OCI lunar images show:
 - Little to no along track straylight.
 - very low straylight in red bands -> no correction needed
 - Blue bands straylight/crosstalk increased toward shorter wavelength
- OCI lunar images indicate prelaunch measurements are contaminated by GSE straylight.
- OCI crosstalk correction LUT was updated based on OCI lunar images and prelaunch data
- Crosstalk correction performed well for green-blue bands, UV bands have increased residuals
- On-going: Crosstalk correction impact on science data (calibrated radiance)

backup

crosstalk map

307 Crosstalk

