# Evaluation of TropOMI Level 1b v2.01 product in Bands 1 - 4

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NASA / GSFC

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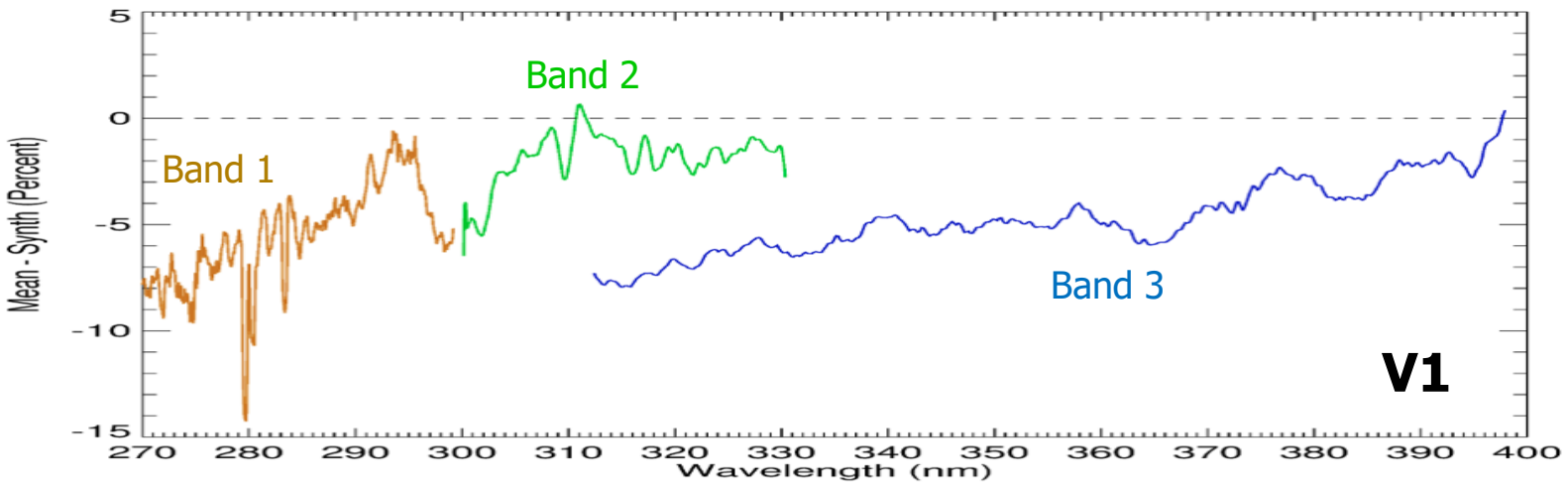
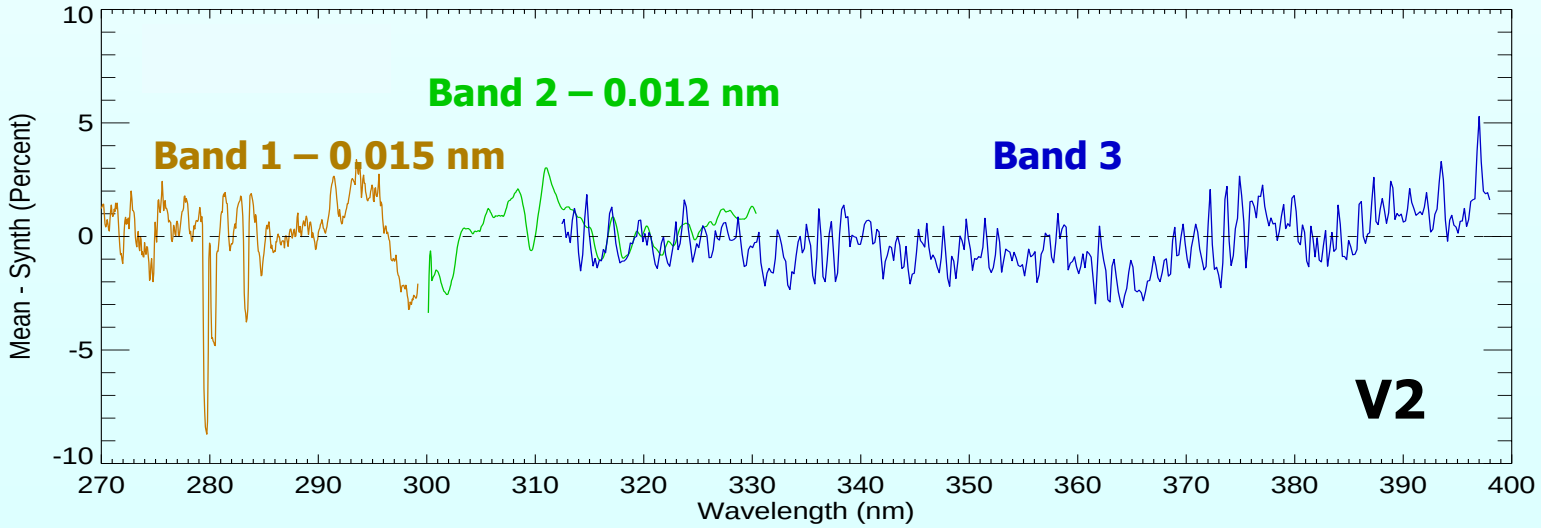
therefore comparisons focus on OMPS

# Prior results: TropOMI solar irradiance

- Comparison to SRF-convolved solar reference

Dobber, M., R. et. al.
DOI: 10.1007/s11207-008-9187-7



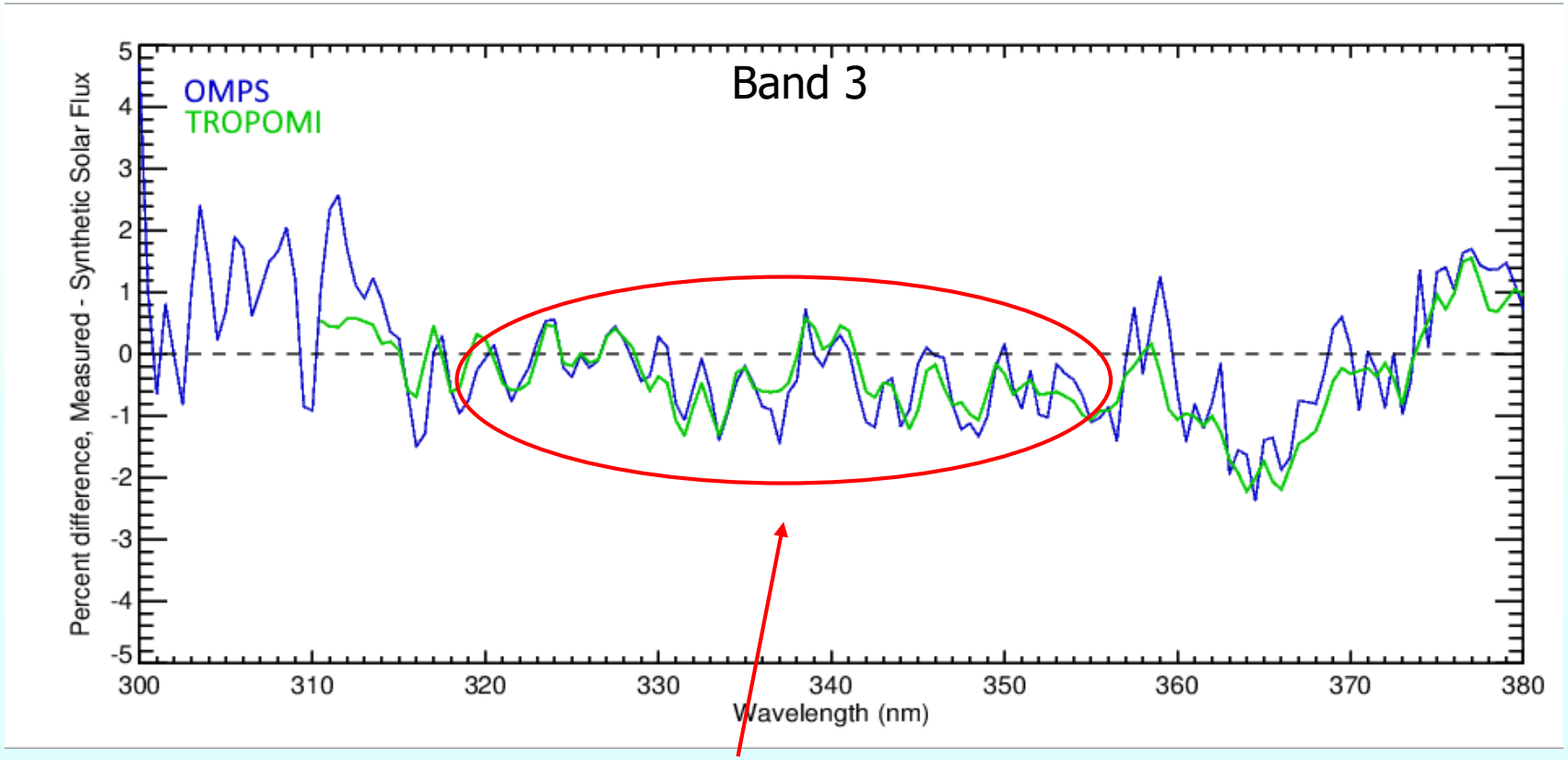




TropOMI irradiance adjusted to SNPP-OMPS using broad cubic spline of their difference

(https://doi.org/10.5194/amt-2019-488)

# Prior results: TropOMI v2 solar irradiance agrees better with reference

- TROPOMI values convolved using OMPS bandpasses – both compared to Dobber reference



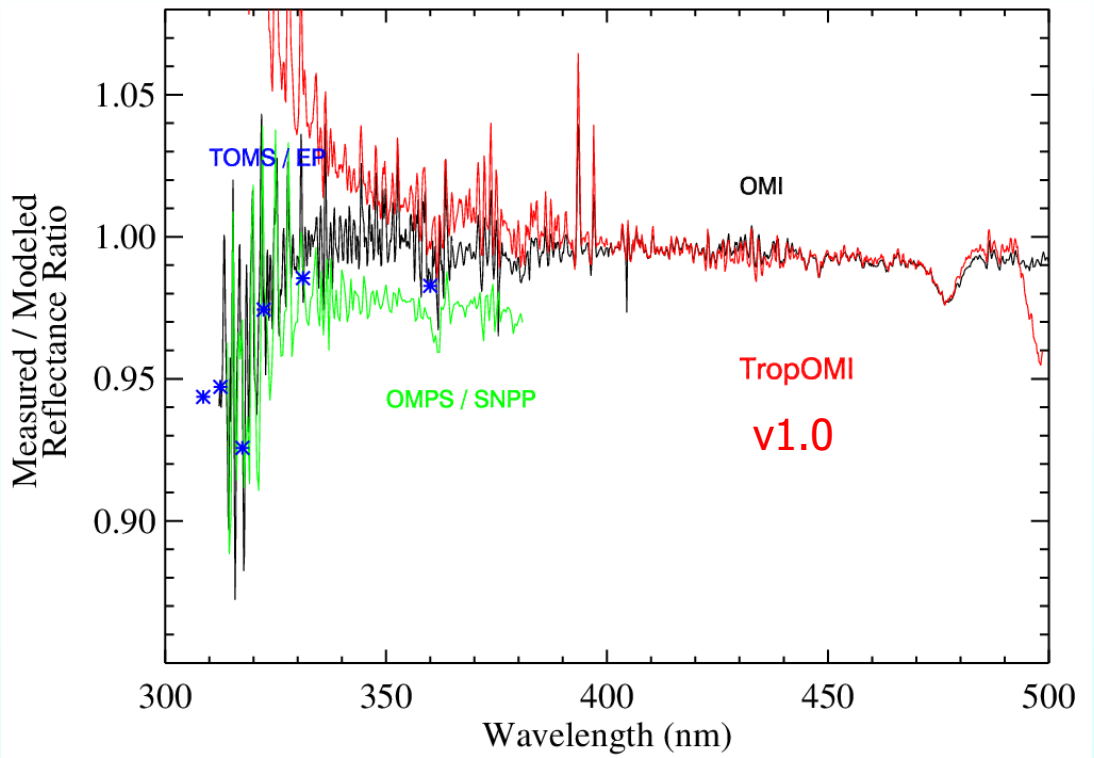

Similar fine structure: probably indicates errors in reference spectrum
Not a result of inter-calibration

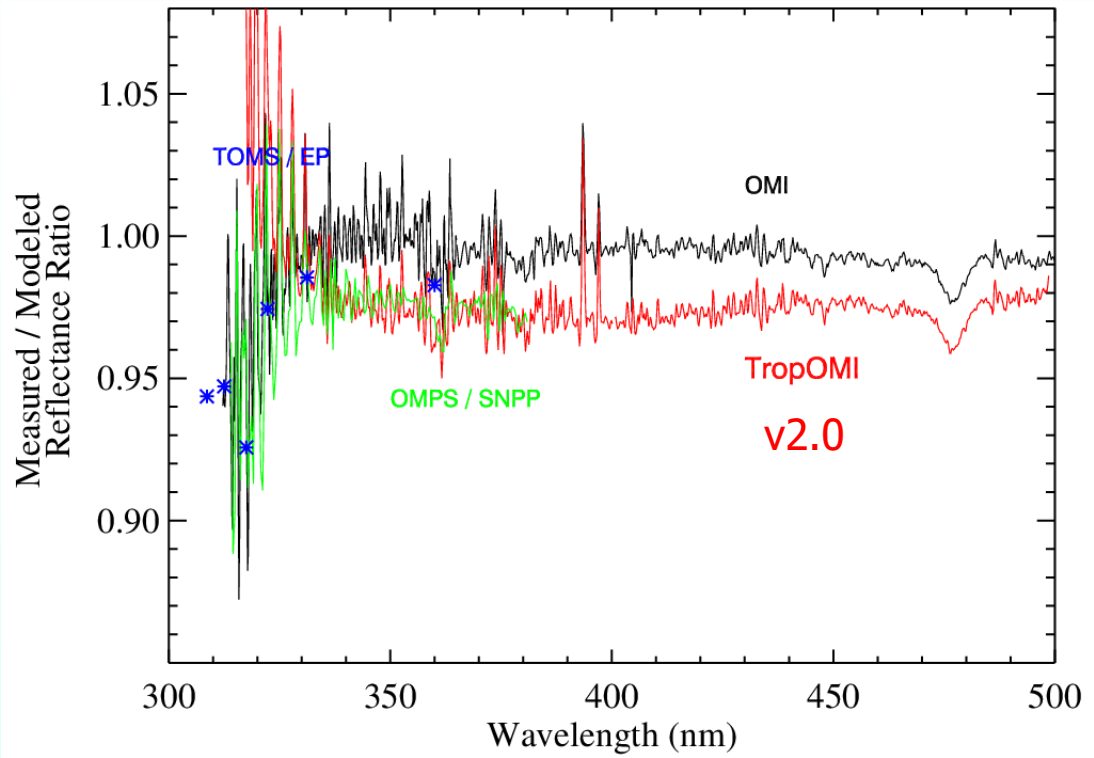
The problem of normalizing solar irradiance to OMPS: it **alters the TropOMI BSDF** in v2.

- A similar adjustment has not been applied to the radiance calibrations
- if original BSDF is thrown out, should it be given a new basis ?

# Prior result: v1.0 vs. v2.0 comparison over Antarctica

Sun-normalized radiance compared to model – Antarctica, 25 Dec. 2018

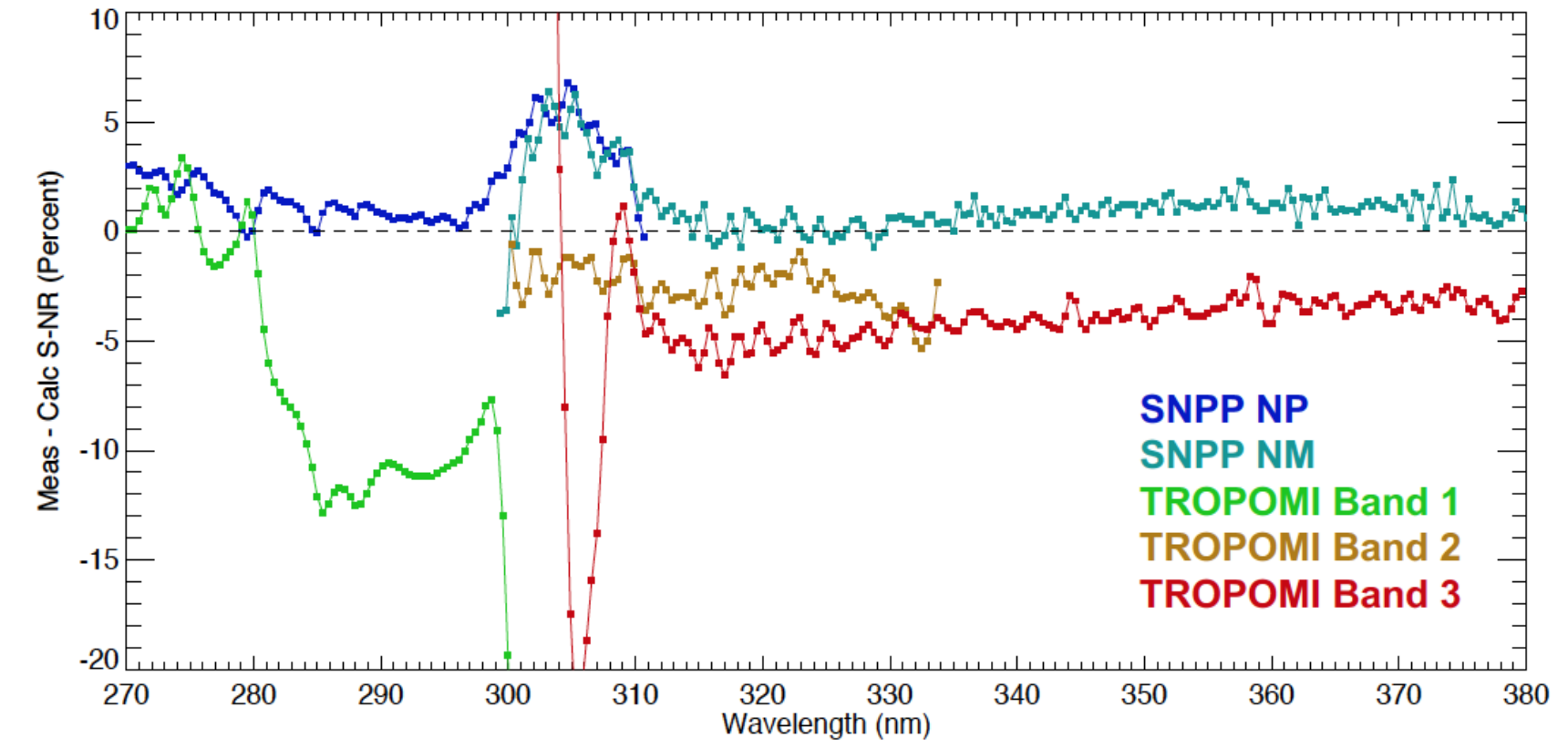



- Improved wavelength dependence
- Absolute agreement got worse

# Prior results: sun-normalized radiance in v2.00

**Scene-matched RTM-residuals comparison (DRCM)**




Presented evidence supporting validity of OMPS reflectivity

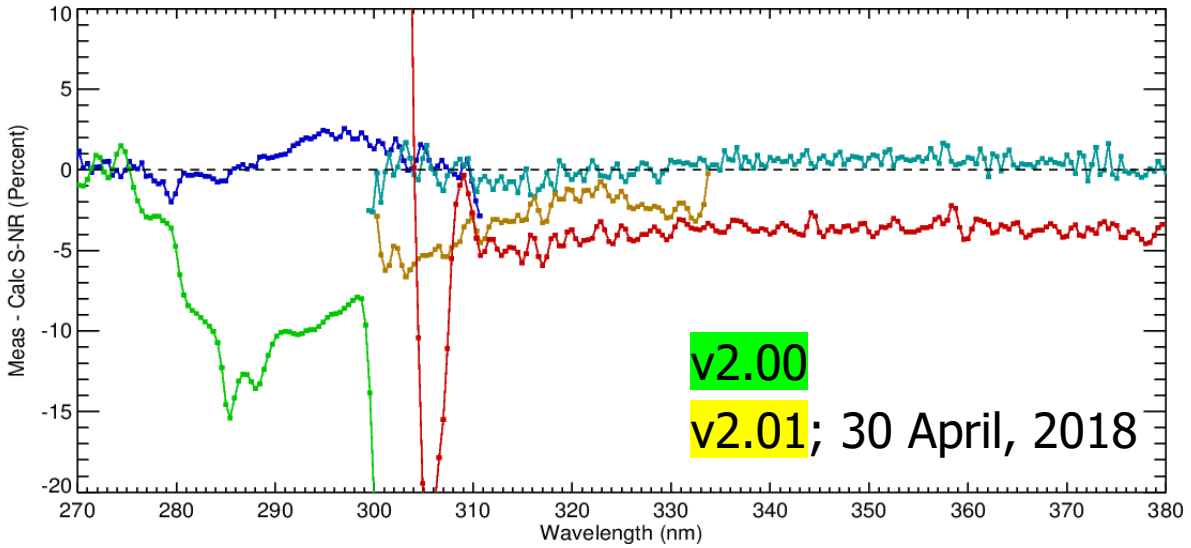
Band 3 involves mostly a λ-independent offset

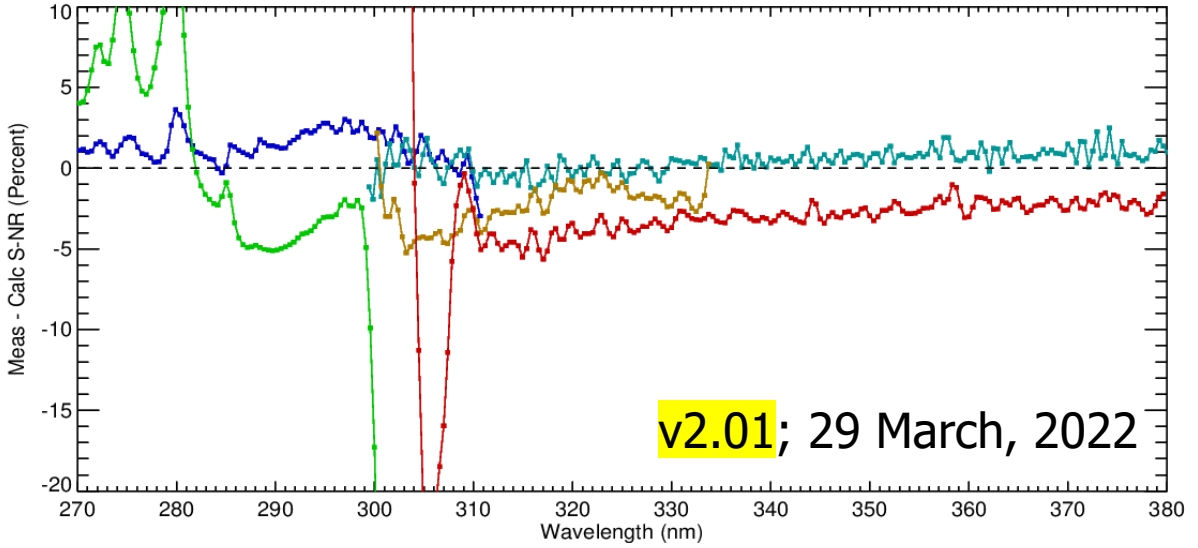
Bands 2 & 3 are inconsistent

Bands 1 exhibits more serious problems

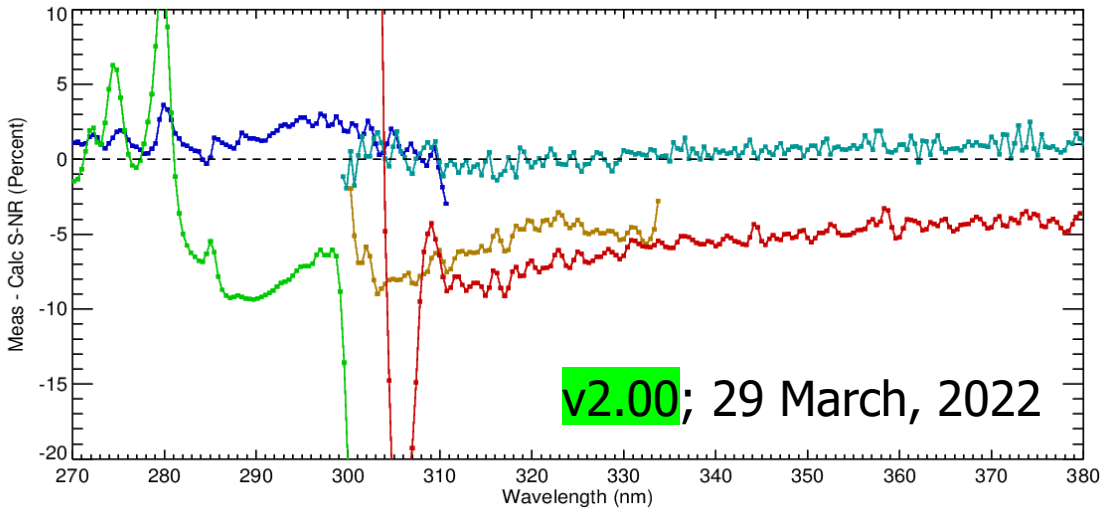
RTM simulation uses MLS O3 profile and OMPS surface reflectivity

# Equatorial DRCM results in v2.01



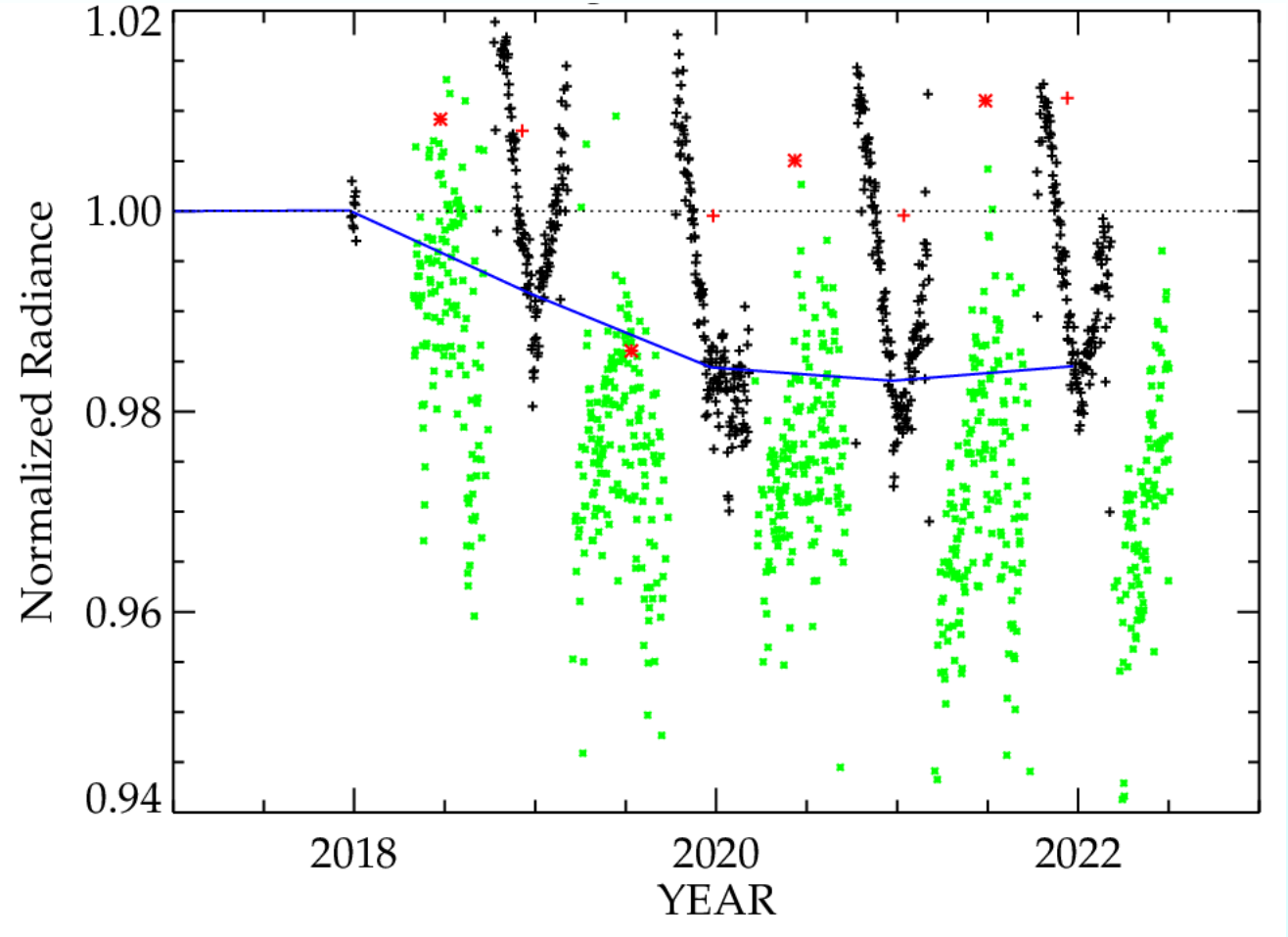




- v2.01 addresses the radiance drift
- Band 3 perhaps over-corrected by ~1%
- Band 2,3 discrepancy not addressed
- Band 1 performance changed over 4 years (solar activity?)



# Ice radiance results confirm drift improvement

354 nm Band 3 Relative Radiance




+ v2.00 Antarctica

✻ v2.00 Greenland

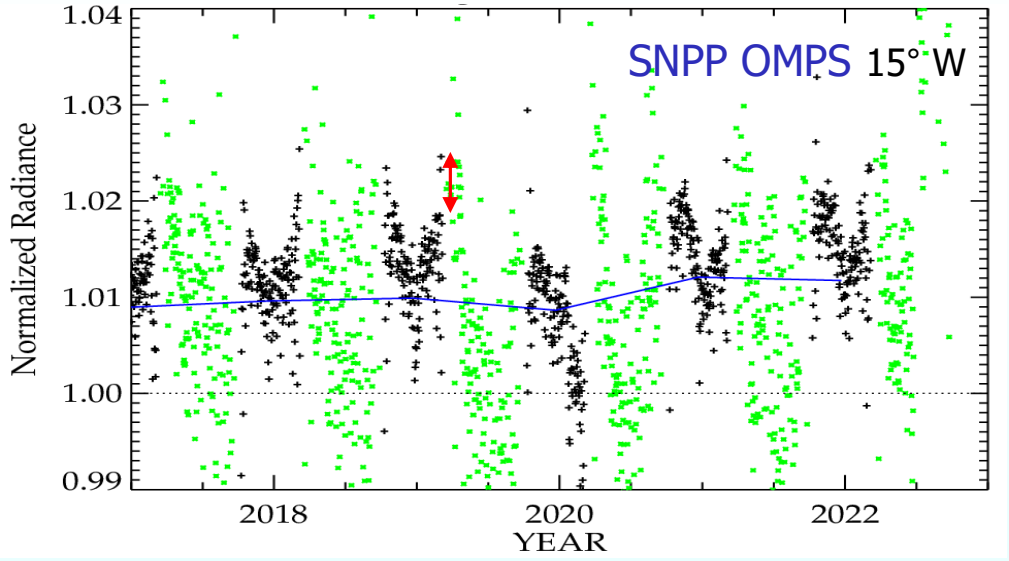
+ v2.01 Antarctica

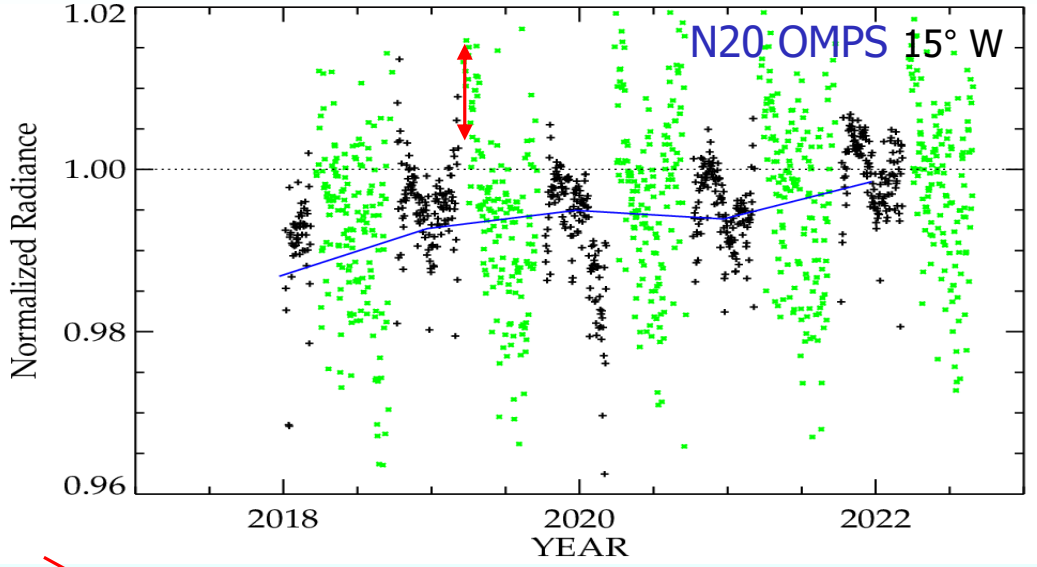
✻ v2.01 Greenland

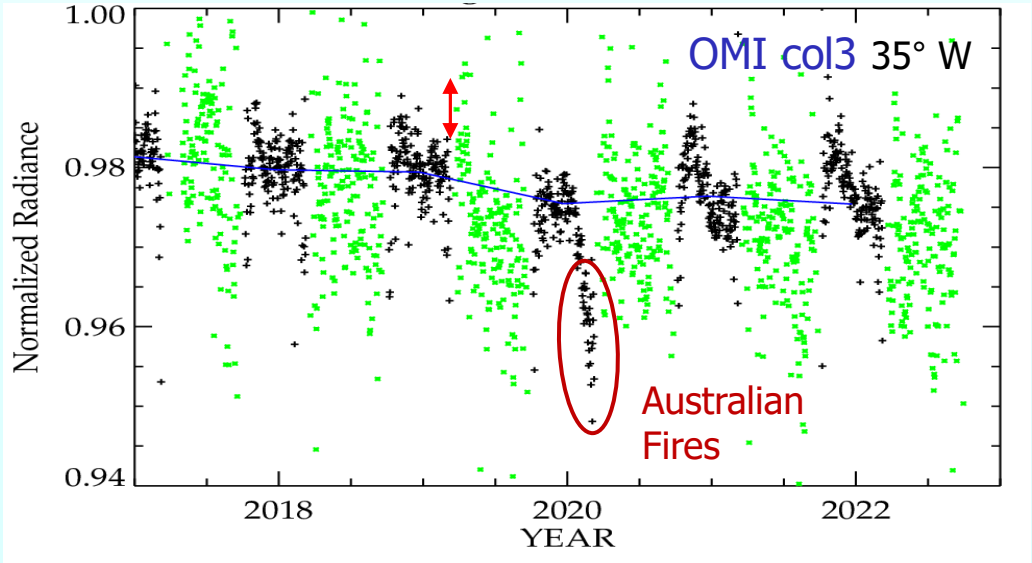
Large seasonal variations in TropOMI ice radiances make conclusions difficult

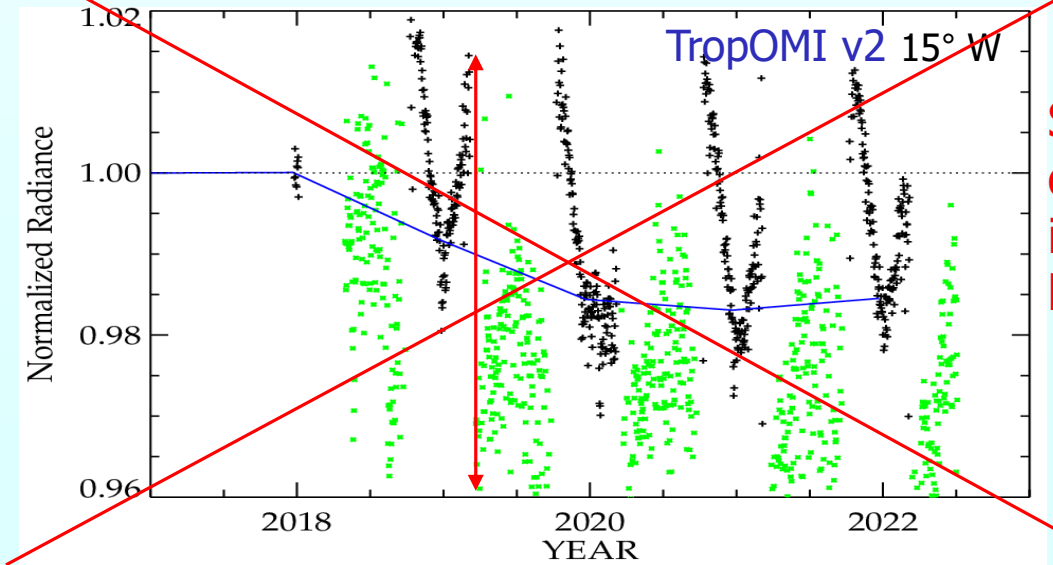
# Multi-mission comparisons over ice point to TropOMI oddity

**Antarctica** **Greenland** 354 nm



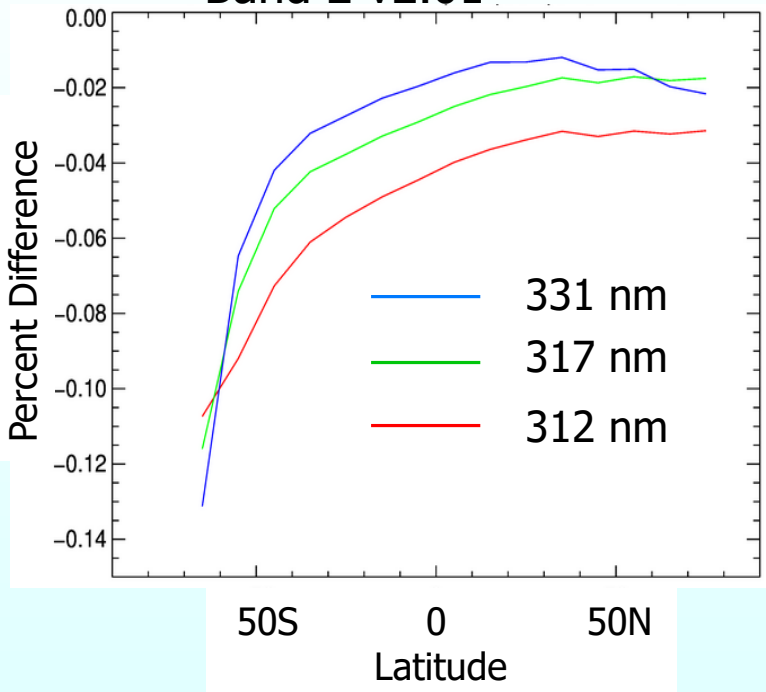

Sun-Earth distance improperly handled

# OMPS matched scenes reveal TropOMI latitude dependence

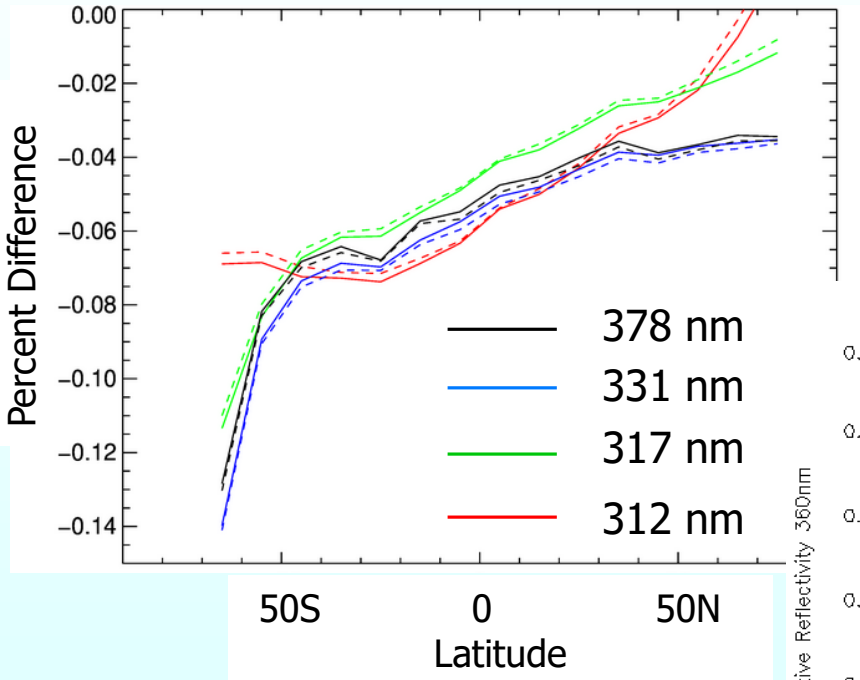
## Radiance differences (TropOMI – OMPS)

30 Apr, 2018

Band 2 v2.01

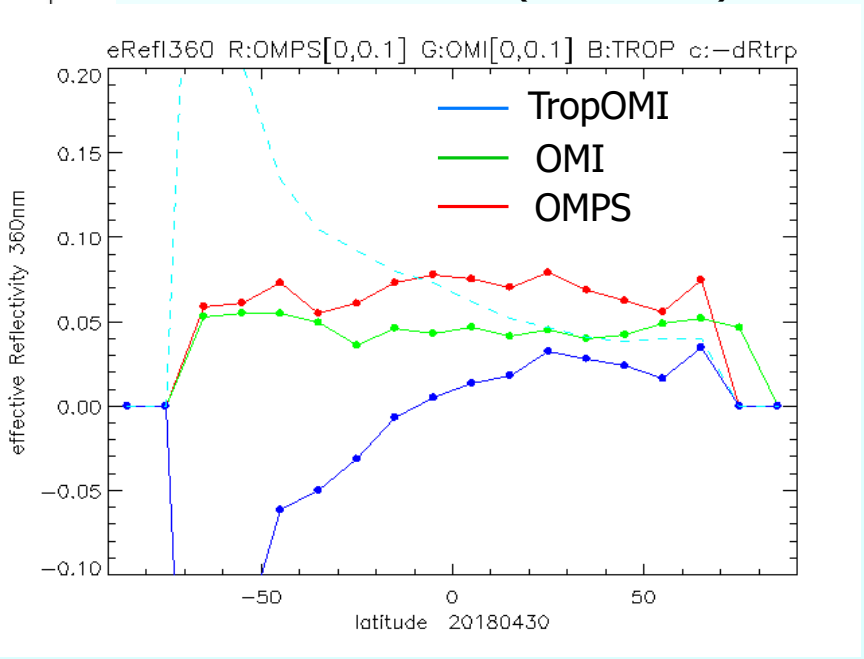



Band 3 v2.01 (v2 dashed)




4.0% slope
(50S:50N)

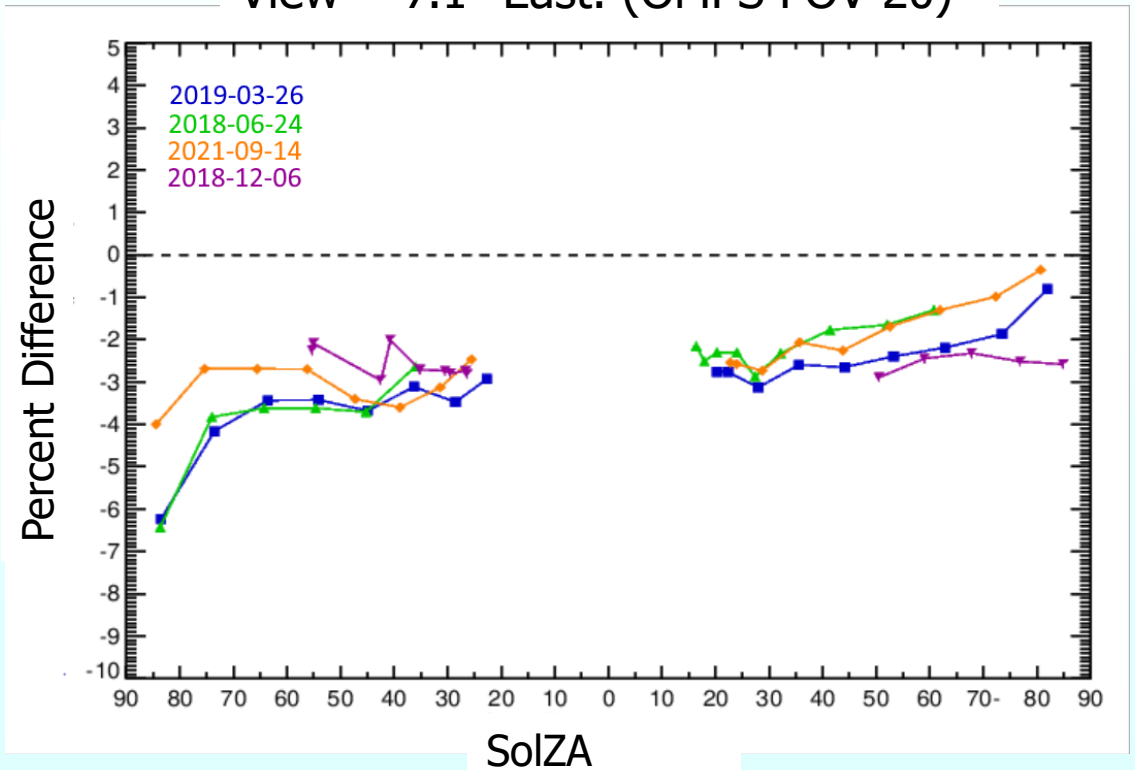
Mean 360 nm LER (cloud-free)



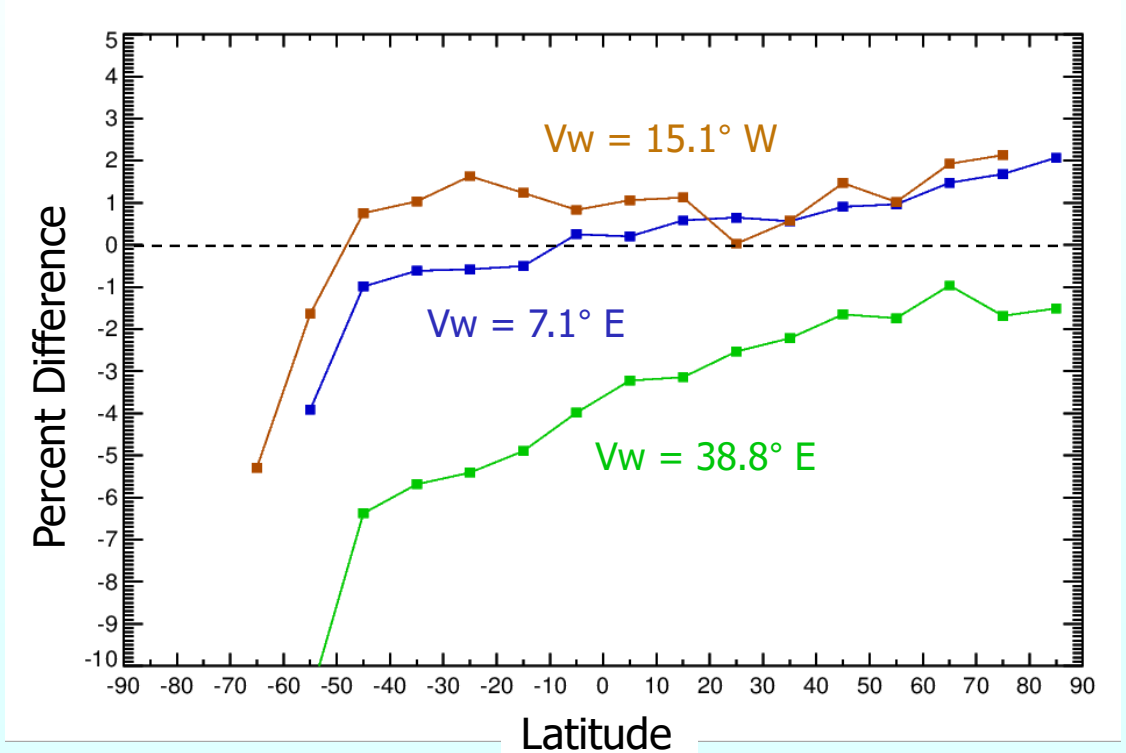
# Seasonal, view angle variation in TropOMI response

TropOMI v2.01 – OMPS NPP Radiance diff. at 360 nm

View = 7.1° East. (OMPS FOV 20)




June 24, 2018



# Summary

- Update of irradiance product in v2 changed the BSDF calibration
  - λ-independent BSDF cal. is too low
  - λ-dependent BSDF cal. is improved
- Long-term radiance drifts (Bands 2-4) removed in v2.01 Level 1B product
- Band 1 still exhibits variations of unknown origin
- Orbital dependence of radiometric response (≤ 5%) has a seasonal and a view angle component