Update on the OMPS NM cloud software, NMCLDRR-L2

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OMPS Science Team Meeting

May 7, 2015

Rotational-Raman scattering cloud algorithm basics

- **Cloud pressures are retrieved from the high-frequency structure of TOA radiance caused by RRS.**
  - The Mixed Lambertian Equivalent Reflectivity (MLER) method.
  - Fixed solar irradiance of Day1 to calculate normalized radiances

- **Reflectivity/Effective cloud fraction at 354.1 nm.**

- **Soft calibration is a key element of the algorithm. Over Antarctic Plateau the scene pressure is assumed be equal to the surface pressure.**
  - Compute spectral residuals (observed minus calculated radiances) for each swath position
  - Use the calculated residuals to correct TOA radiances
  - Determined from Dec. 2012 data

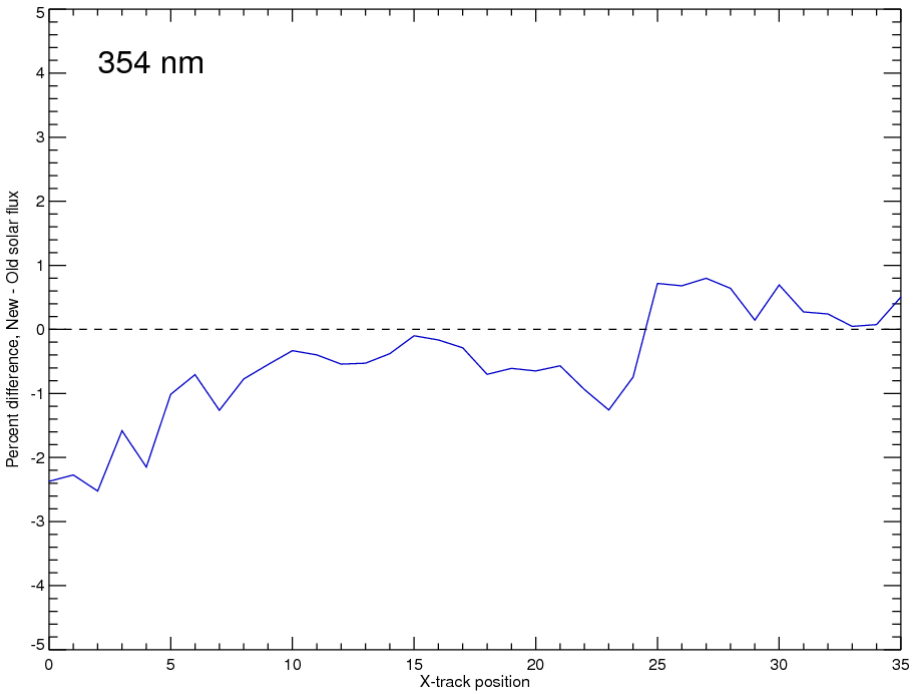
New NM L1B data

- Test data reside in /omps/live/dd/85605/NMEV-L1B/
- Improved wavelength registration of Earthshine radiances (400 x36x196)
  - requires new soft calibration of radiances
- Changes to Day 1 solar flux due to
  - new calibration coefficients
  - different “stitching” of diffuser positions
- New structure of L1B files
  - requires updates to a few software modules that read in L1B data
- New filename conventions

Comparison of New OMPS solar flux to V1 OMPS solar flux

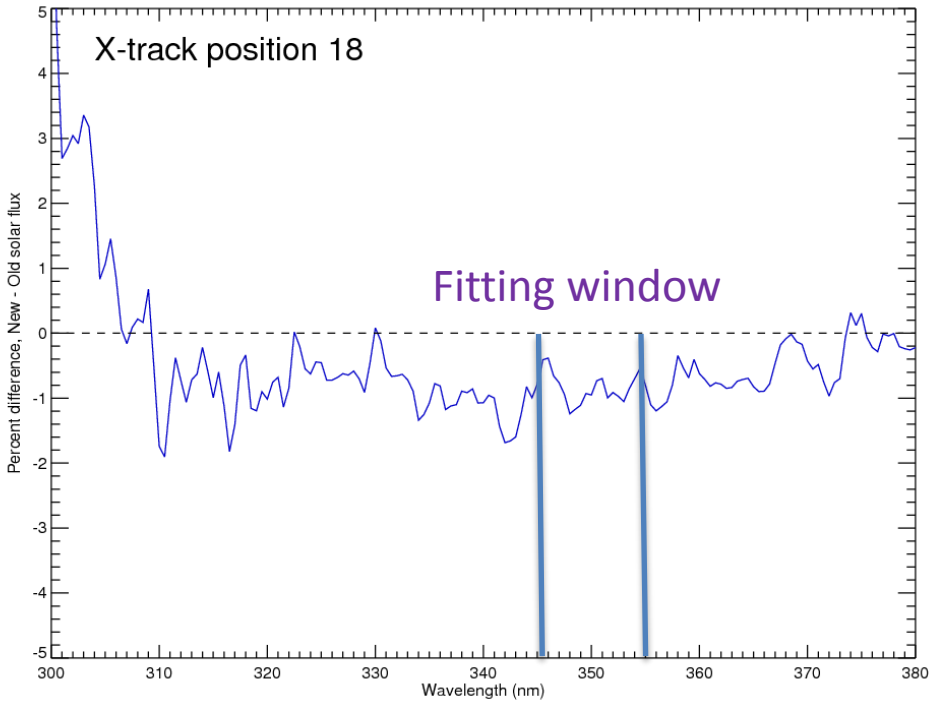
Solar flux differences (new – old)

as a function of X-track position at wavelength 354 nm



Differences significantly depend on X-track position and can be up to 2.5%

as a function of wavelength at macro X-track position #18

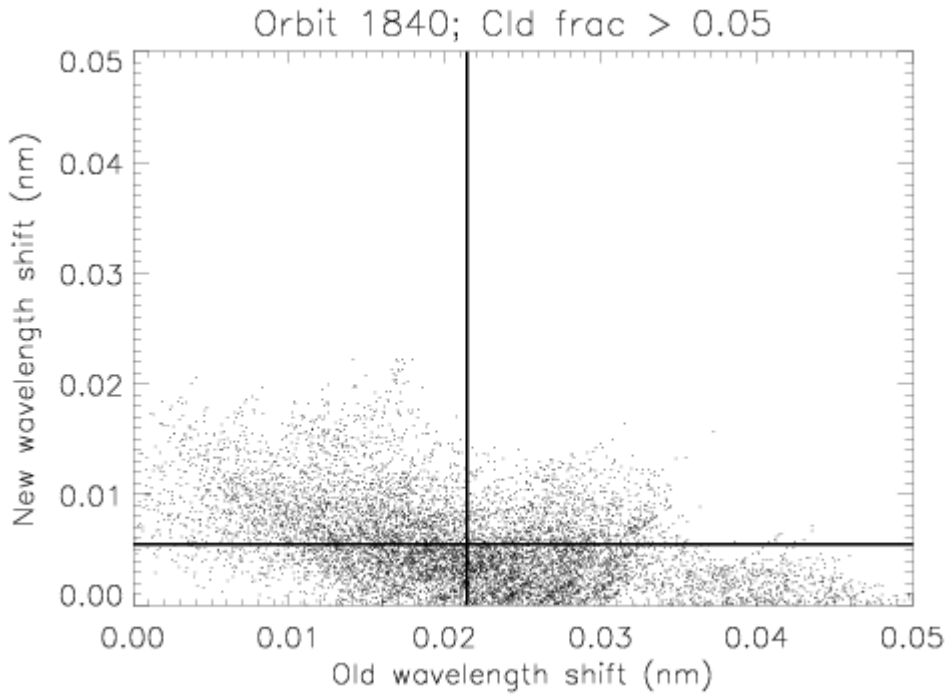


Spectral differences vary from 0.4% to 1.2% within the fitting window

Wavelength shifts

Wavelength shift between Earthshine radiance and solar irradiance is calculated while retrieving cloud pressures.

Comparison for orbit 1840 of March 06, 2012 (mostly over the Pacific).



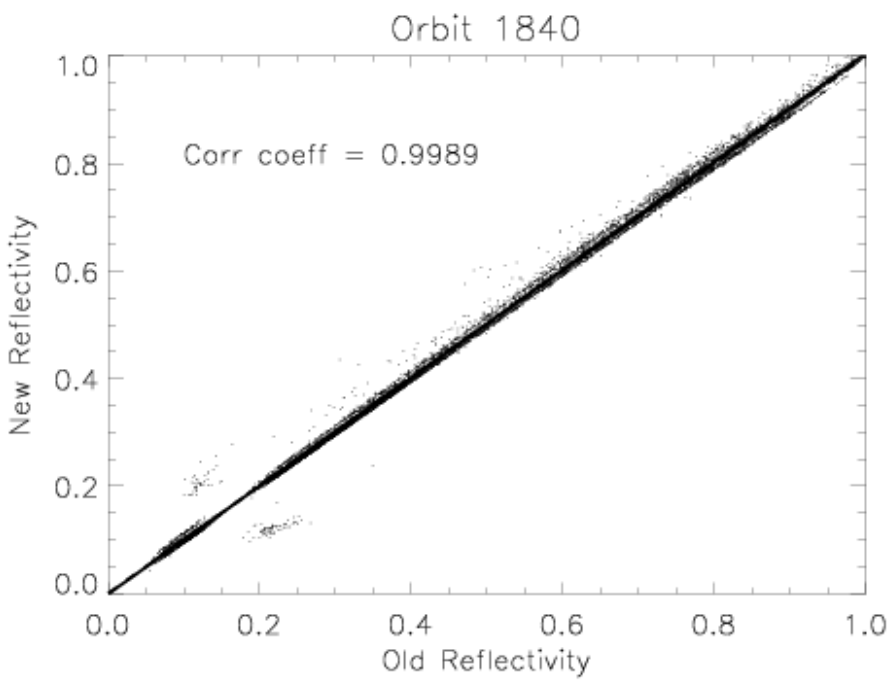
Vertical line – mean wavelength shift for old L1B data

Horizontal line – mean wavelength shift for new L1B data

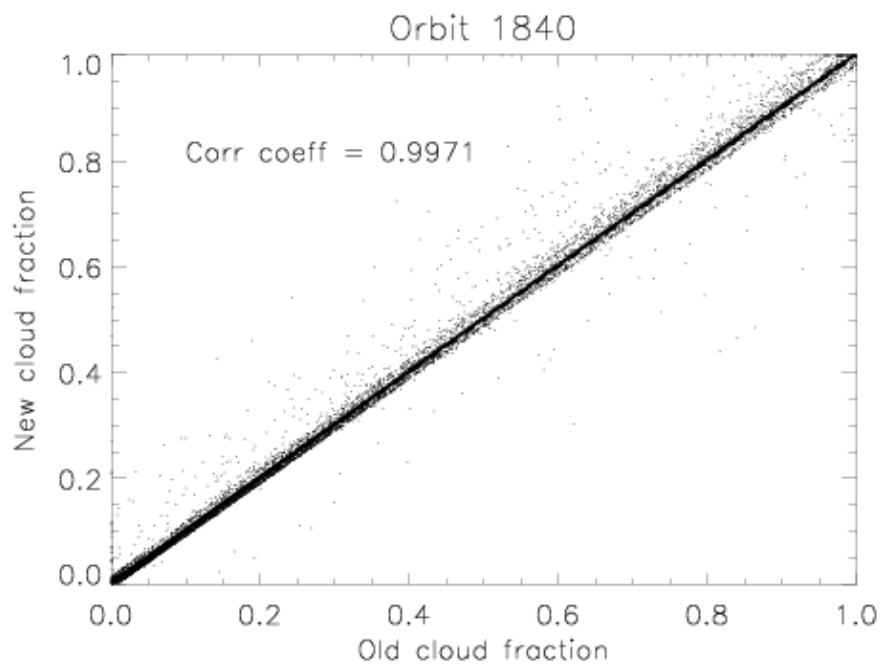
The use of new L1B data reduces the wavelength shifts by a factor of about 4

Reflectivity and cloud fraction

Reflectivity comparison



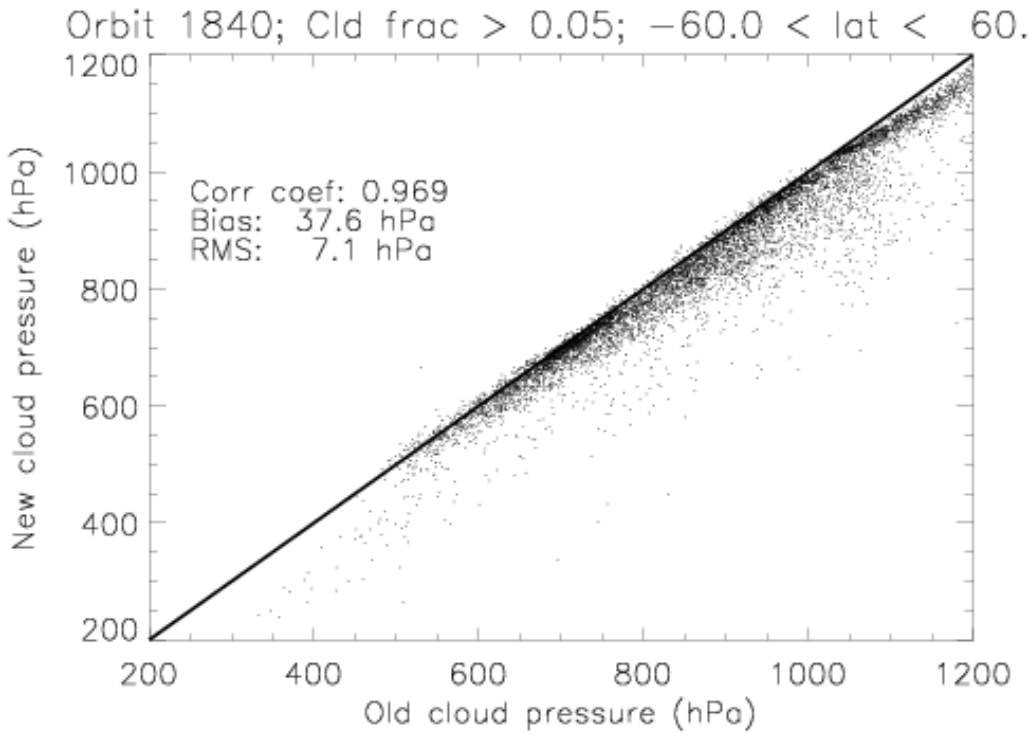
Cloud fraction comparison



Differences in reflectivity and cloud fraction are due to changes to Day 1 solar flux.

The correlation coefficients exceed 0.997.

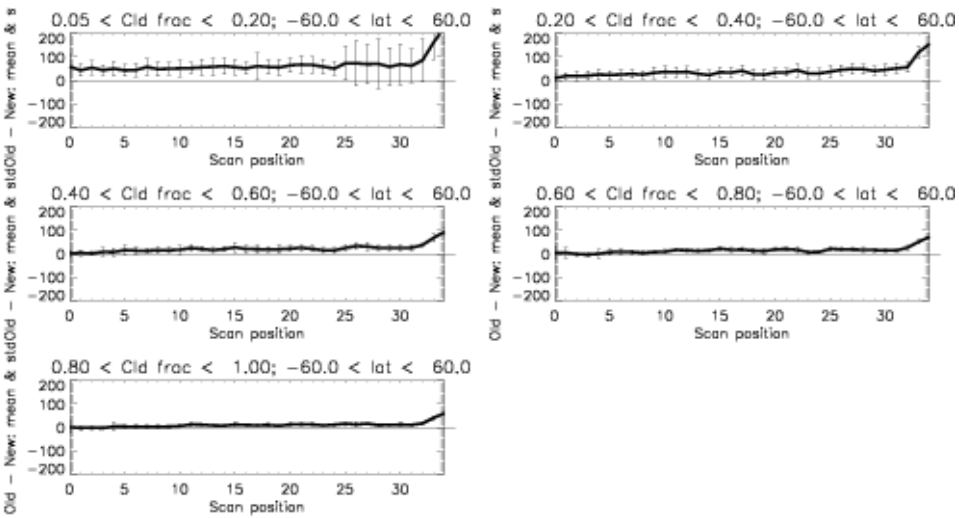
Cloud pressures



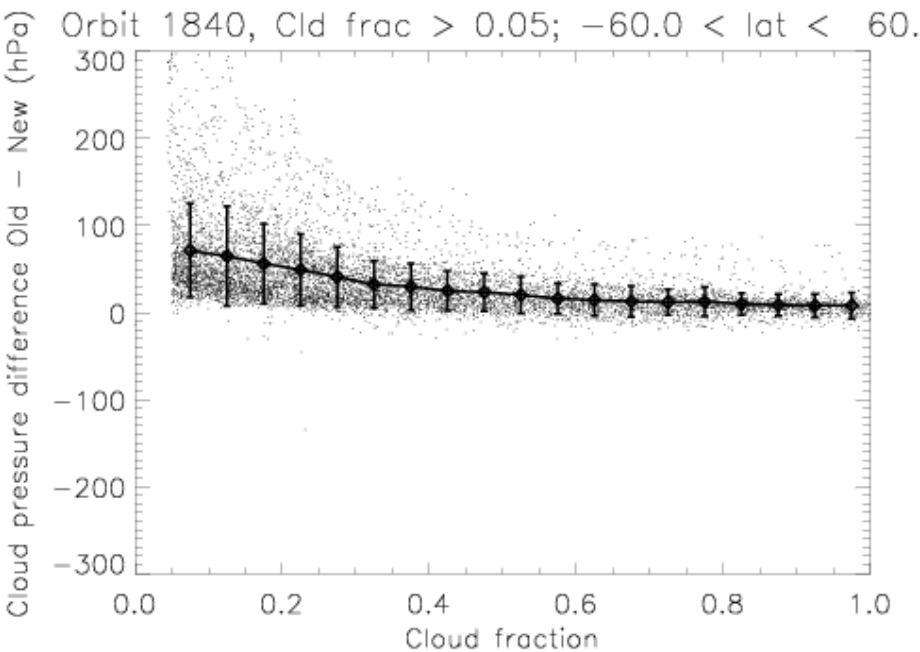
The use of new L1B data slightly decreases the retrieved cloud pressures. The mean difference is equal to 37.6 hPa

Cloud pressure differences (old – new)

as a function of cross-track position



as a function of cloud fraction



- Differences are mostly for low cloud fraction
- Higher differences for cross-track positions # 34 & 35; not clear why

- Cloud pressure differences decrease with cloud fraction increasing
- Mean cloud pressure difference maximum is about 70 hPa at f = 0.05-0.1

The use of soft calibration based on the previous version of NM L1B data results in much higher cloud pressure differences reaching 300 hPa.

Summary

- NMCLDRR-L2 v0.5 is run operationally starting at orb 18226
  - Fixed bug (preventing monthly updates of surface reflectivity)
  - Replaces TC-L2-CLDRR
- OMPS NM cloud algorithm is sensitive to changes in wavelength registration
  - New soft calibration is absolutely necessary
  - Wavelength shifts between Earthshine radiance and solar irradiance are significantly reduced
- Effective cloud fraction differences are small
- Cloud pressure differences decrease with cloud fraction increasing
  - Mean cloud pressure difference reaches the maximum of about 70 hPa at cloud fractions of 0.05-0.1
- Analysis will be redone once calibration is modified
  - See previous talk (Seftor)