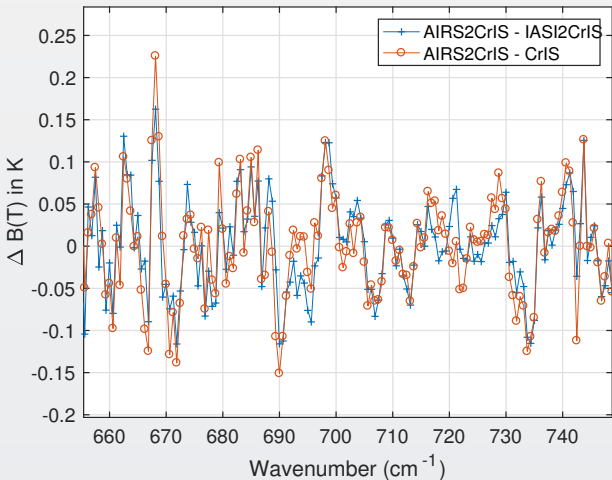# Can We Improve the AIRS ILS Functions Using CrIS?

L. Larrabee Strow, Howard Motteler, Chris Hepplewhite, Steven Buczkowski, and Sergio De-Souza Machado (UMBC)
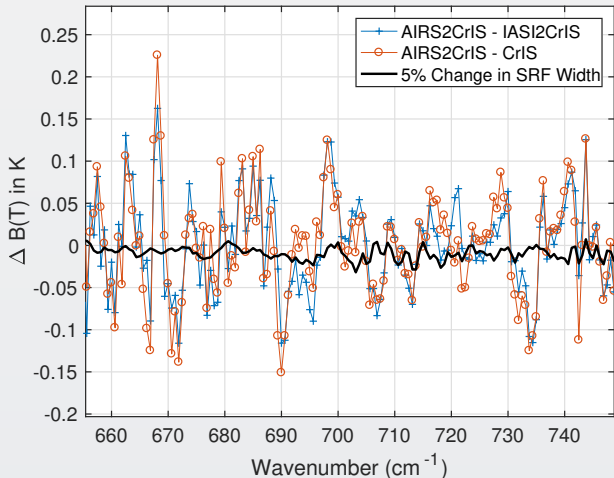
June 20, 2018

AIRS SNOs with IASI and CrIS Show Same Patterns

- SNO differences are run through a high-pass only filter
- Eliminates smooth SNO diffs that could be CrIS, IASI, or AIRS

Could Patterns be due to AIRS SRF Width Errors?

- AIRS SRF width uncertainties are ~5% (TVAC data)
- Black line: reduce SRFs by 5%, what is the expected SNO difference

Other SRF Errors, since it is not the widths?

- Simulations of SNO sensitivty to uncertainties in the SRF *centroids* are too small to create observed patterns
- Entrance filter fringe shifts (seen before/after Nov. 2003 Aqua shutdown) are not the cause, they are far too small

Tom Pagano has done a re-calibration of AIRS L1b based on a better analysis of TVAC data. The new candidate calibration is v7 (as opposed to present v5 calibration)
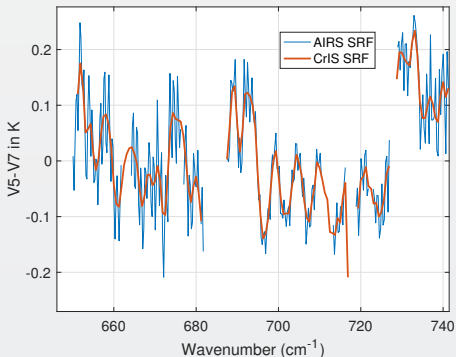
We now compare the SNO data to the v5 - v7 calibration differences.

We show two types of plots:

1. AIRS/CrIS SNOs compared to V5 - V7 calibration differences
2. AIRS/CrIS v5 SNOs (present L1b) compared to AIRS/CrIS v7 SNOs

AIRS/CrIS v7 SNOs = (AIRS_v5/CrIS SNOs) - (v5 - v7 Cal Diffs)

# First Convert v5 - v7 B(T) Differences to CrIS ILS/SRF

Approach
- Tom Pagano's v5 - v7 differences use AIRS SRF, 2378 channel set
- We need to compare to CrIS on the AIRS2CrIS scale (CrIS NSR resolution)
- Conversion to CrIS SRF
    1. We add Tom's v5 - v7 to a similar L1c B(T) spectrum
    2. Convert this to AIRS2CrIS
    3. Subtract this B(T) from un-perturbed AIRS2CrIS spectrum
    4. You now have Tom's v5-v7 diffs on the CrIS SRF scale
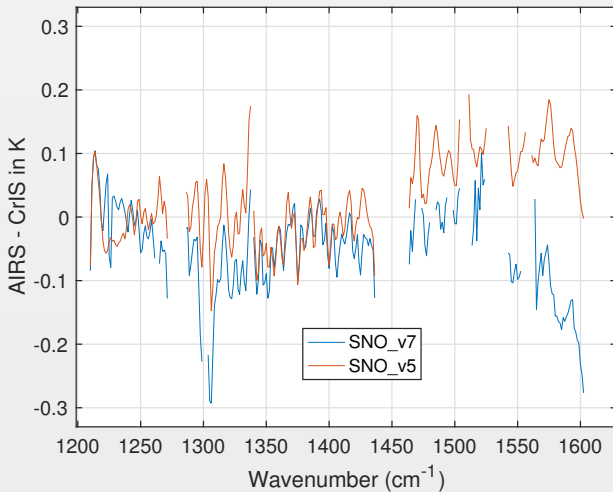
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Overview of SNO Diffs to v5-v7 Diffs
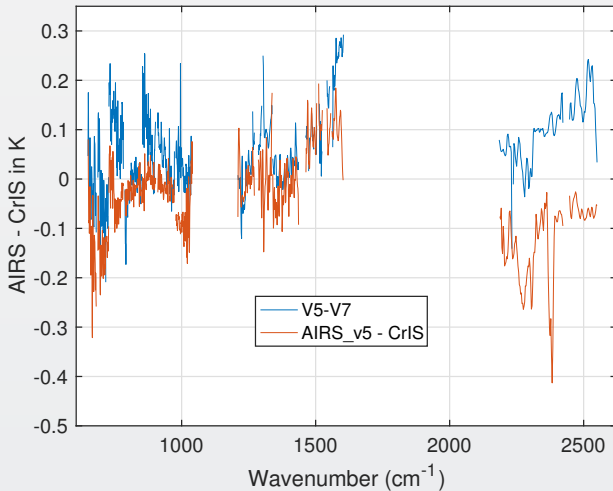
- Highest similarity in the mid-wave
- Same similar patterns in the long-wave

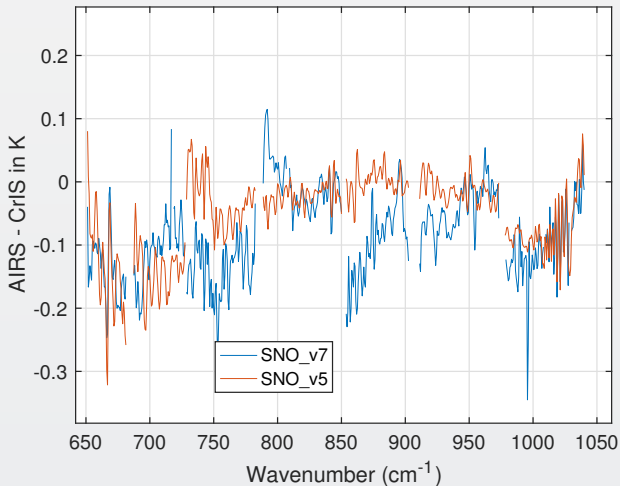# Create SNO_v7 and Compare to SNO_v5
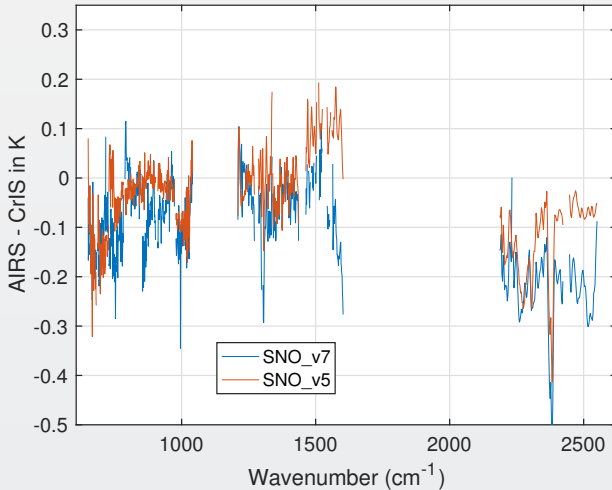
- Shortwave: v5 SNO "better", ie smaller SNO differences

Midwave SNO_v7 versus SNO_v5

- v7 Problems near 1300 cm^{-1} (low B(T)'s there)
- Some improvement with v7 near 1500 cm^{-1}, but no obvious winner

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Longwave SNO_v7 versus SNO_v5

- SNO_v5 more uniform

Conclusions

- Both AIRS-CrIS and AIRS-IASI SNOs suggest that AIRS radiances have significant channel-to-channel calibration differences
- We cannot attribute those differences to the AIRS SRF wdiths, centroid, or entrance filter fringe shifts
- Tom Pagano's new v7 calibration improves AIRS-CrIS SNO in some regions, makes them worse in others. Better/worse based on minimal changes