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Some Early Results Assimilating ACSPO VIIRS L2P Datasets

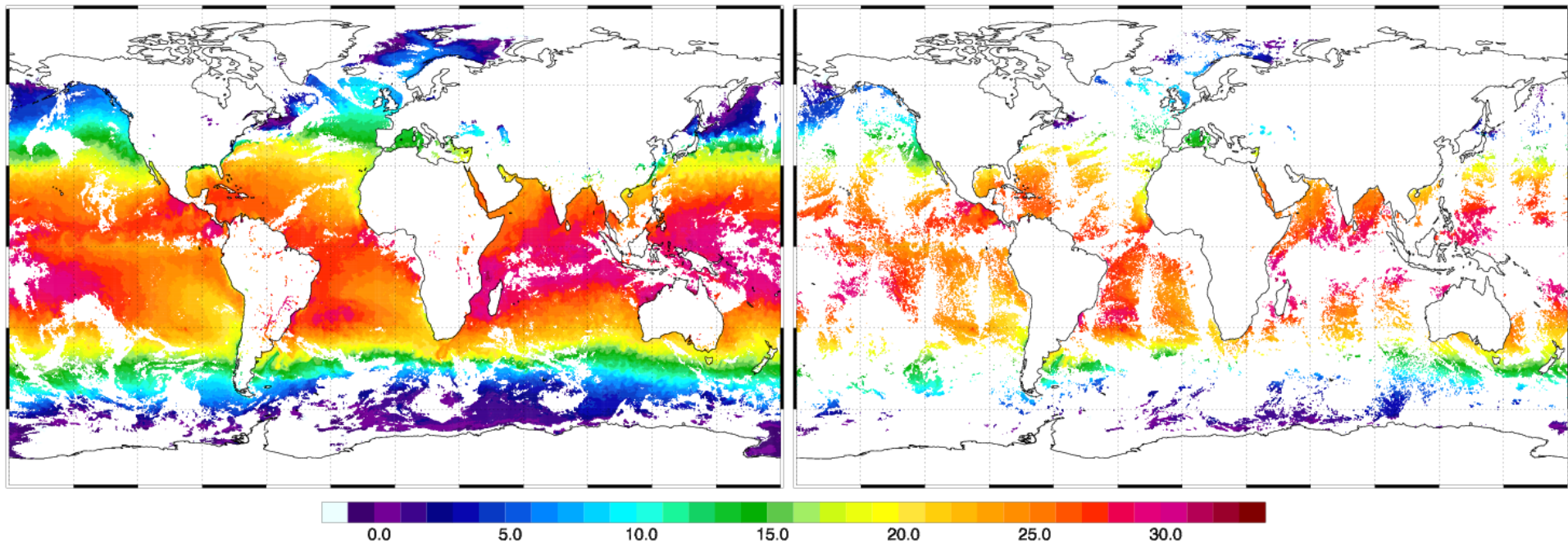
**Bruce Brasnett
Canadian Meteorological
Centre
May, 2014**

ACSPO VIIRS L2P Datasets

- Received courtesy of colleagues at STAR
- Two periods: 1 Jan. – 31 March, 2014 and 15 Aug. – 9 Sept. 2013
- Daily coverage is excellent with this product
- Experiments carried out assimilating VIIRS data only and VIIRS data in combination with other satellite products
- Rely on independent data from Argo floats to verify results
- Argo floats do not sample coastal regions or marginal seas



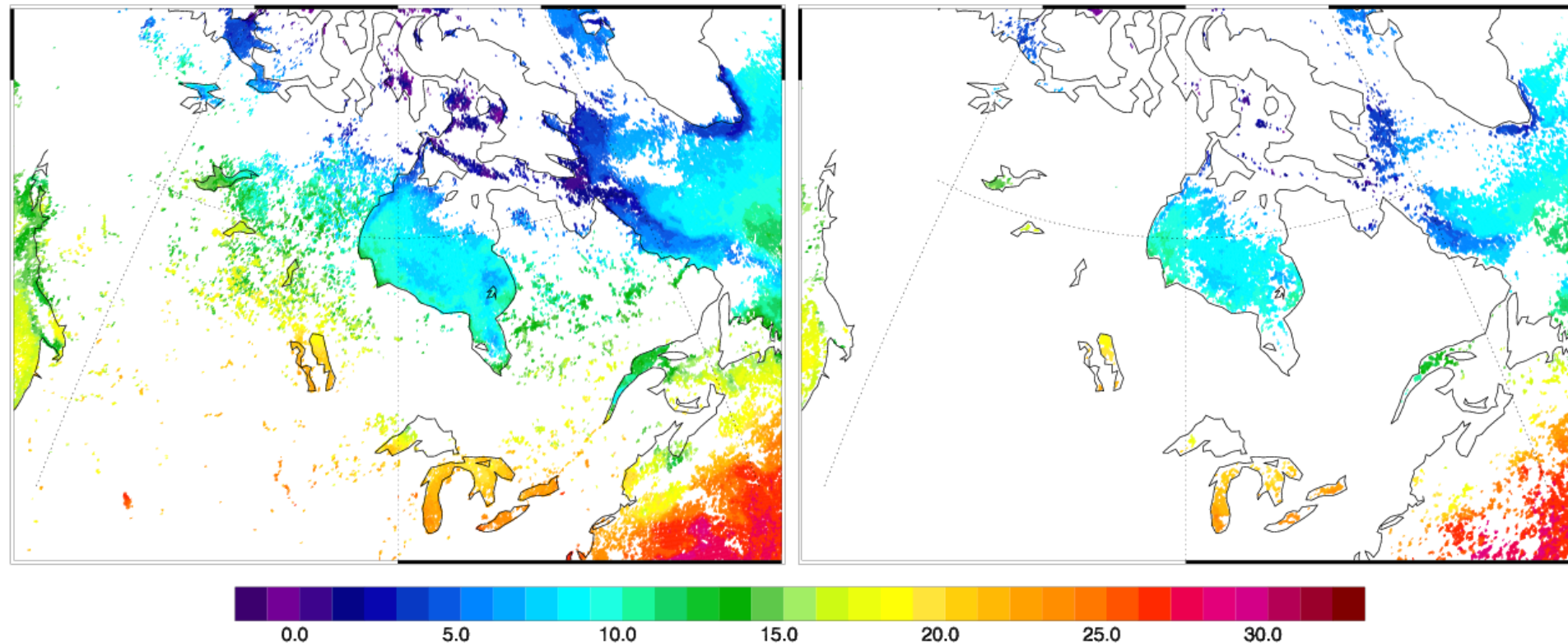
Coverage for 2014/02/01



ACSPO VIIRS

NAVO AVHRR19

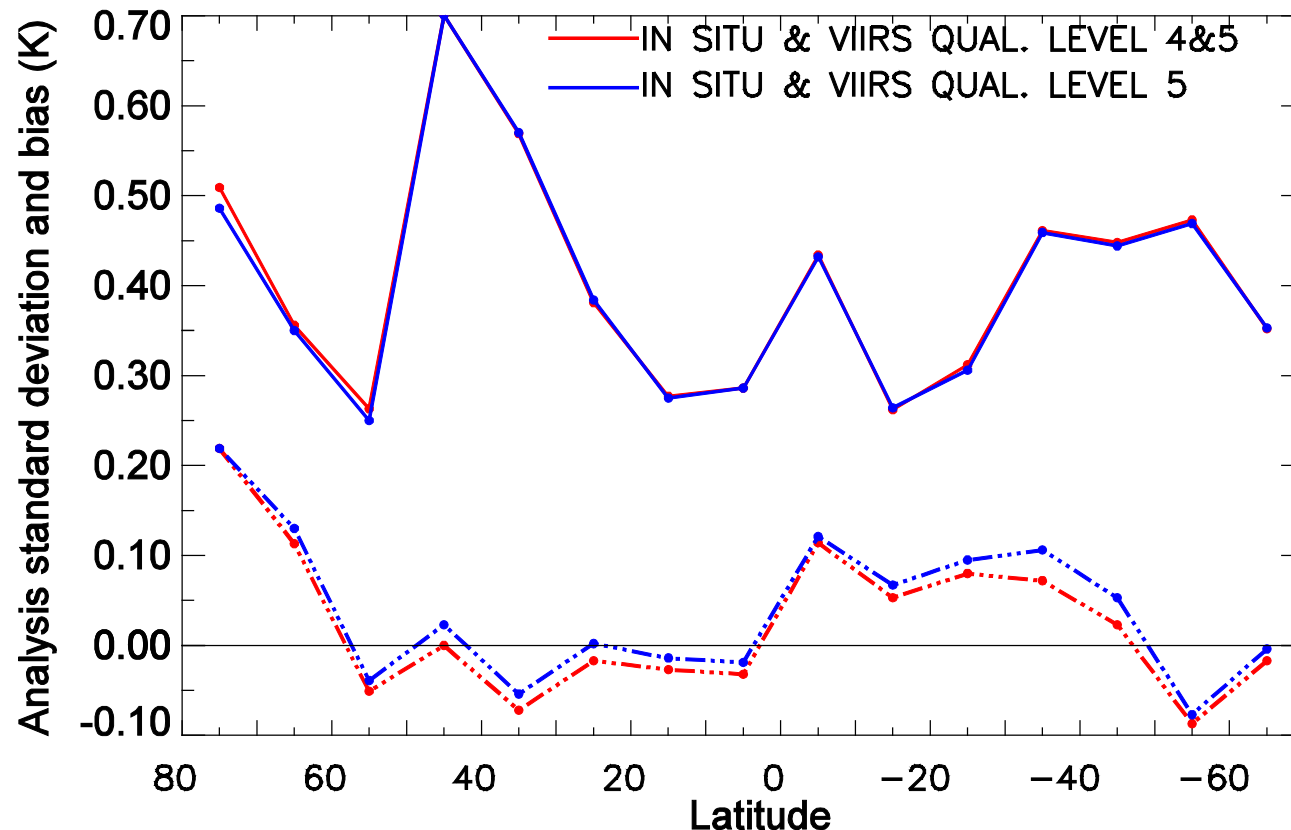
Coverage for 2013/09/01



ACSPO VIIRS

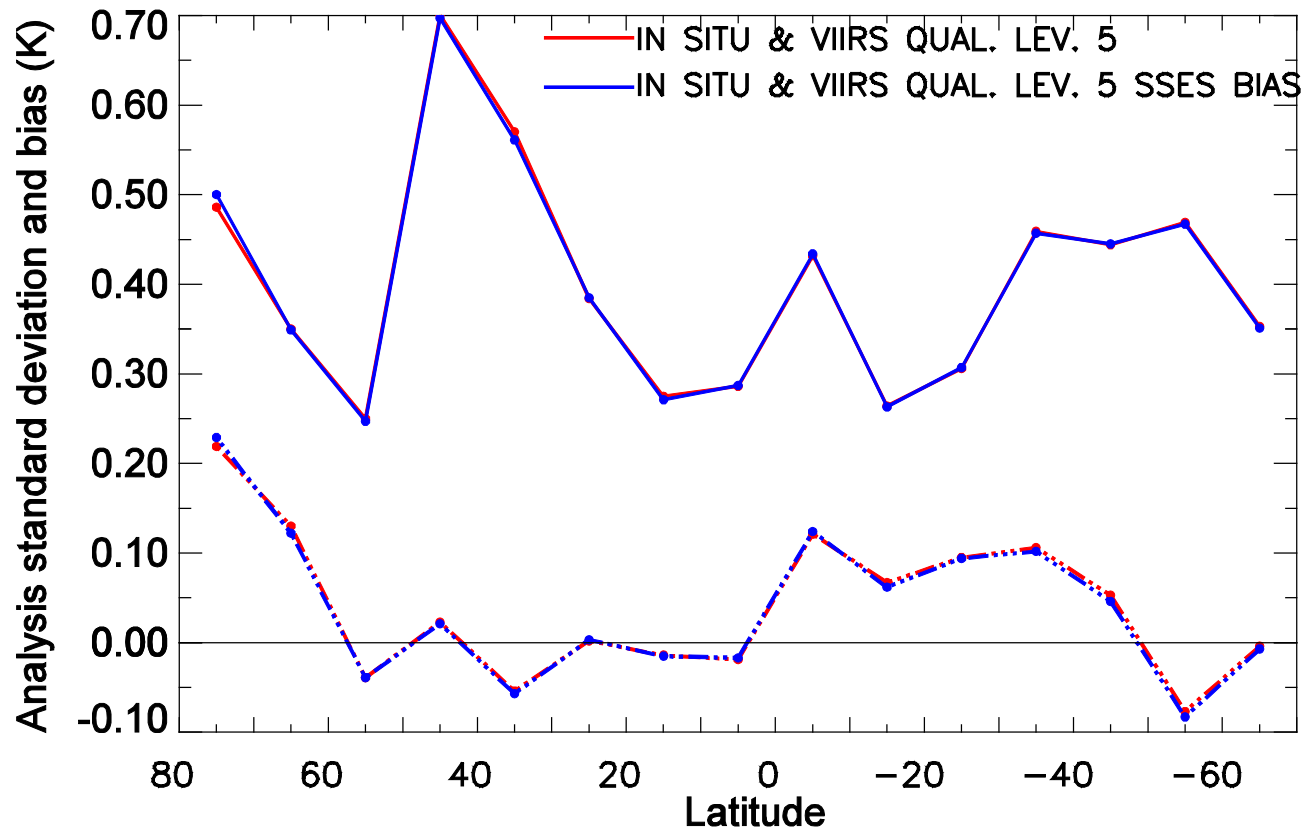
NAVO AVHRR18 & 19
and Metop-A combined

Assessing utility of the ACSPO quality level flag



Including QL=4 leads to a small cold bias but does not affect the STD

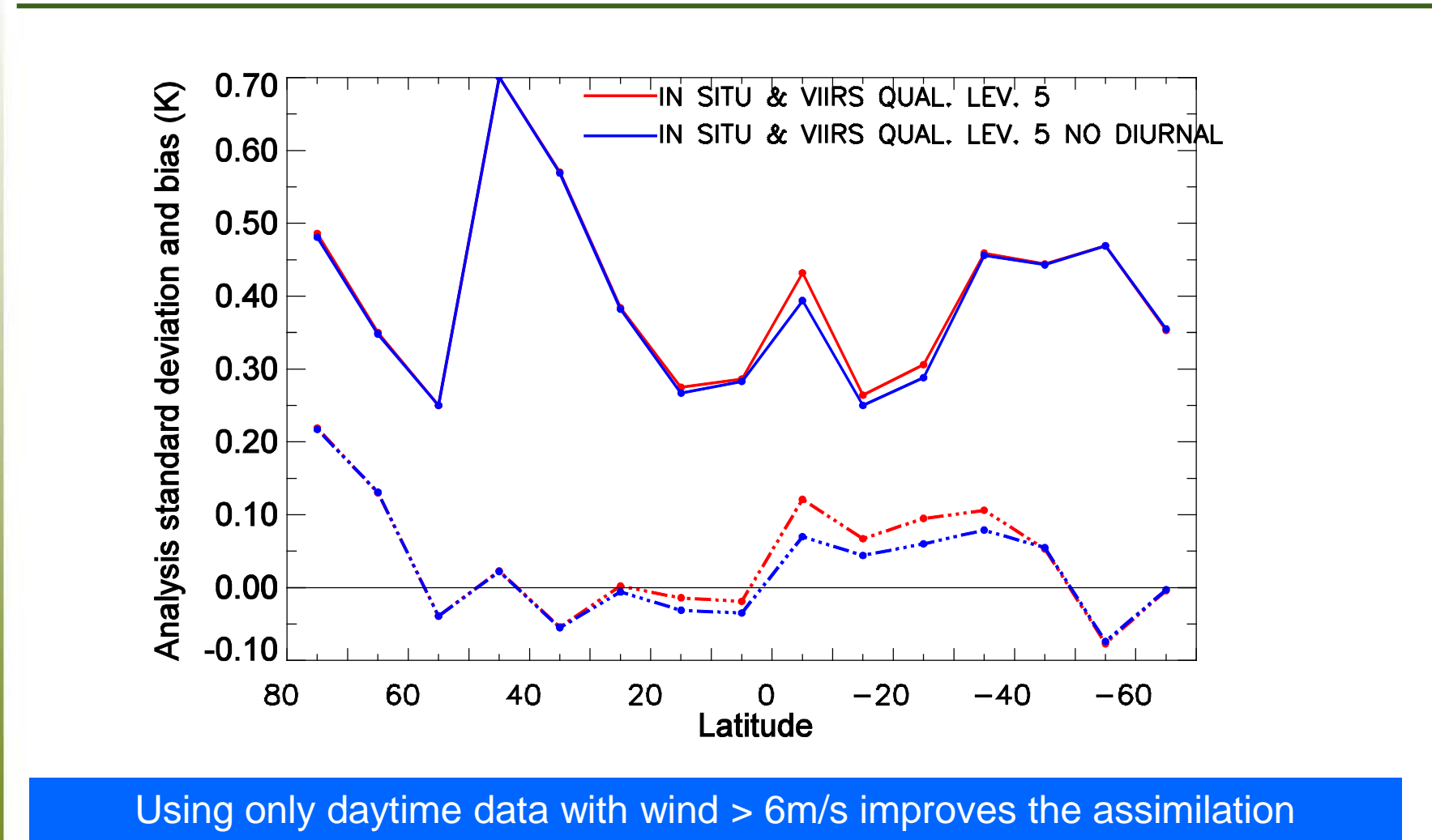
Assessing utility of ACSPO SSES bias estimate



De-biasing VIIRS SST using ACSPO SSES bias does not affect assimilation

The graph displays the Analysis standard deviation and bias (K) on the Y-axis (ranging from -0.10 to 0.70) against Latitude on the X-axis (ranging from 80 to -60). Two main data series are plotted: 'IN SITU & VIIRS QUAL. LEV. 5' (red solid line with dots) and 'IN SITU & VIIRS QUAL. LEV. 5 NO DIURNAL' (blue solid line with dots). Both series show a significant peak in standard deviation and bias around 40° latitude, with the 'NO DIURNAL' series reaching a higher peak of approximately 0.70 K compared to the 'IN SITU & VIIRS QUAL. LEV. 5' series which peaks at approximately 0.60 K. The 'IN SITU & VIIRS QUAL. LEV. 5' series generally shows lower standard deviation and bias across most latitudes compared to the 'NO DIURNAL' series. Additionally, there are two dotted lines (red and blue) representing bias, which are much lower than the standard deviation values, generally staying between -0.10 K and 0.10 K.

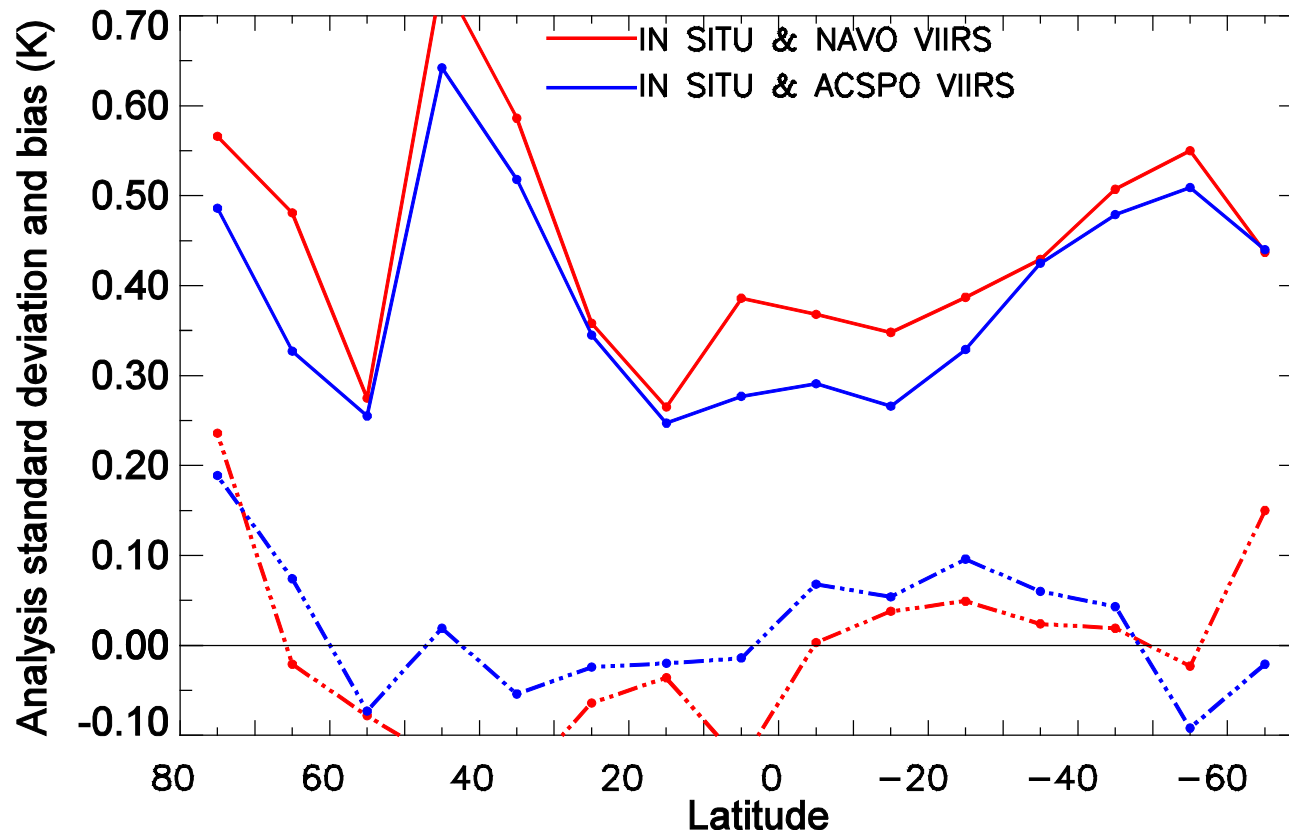
| Latitude | IN SITU & VIIRS QUAL. LEV. 5 (Std Dev) | IN SITU & VIIRS QUAL. LEV. 5 NO DIURNAL (Std Dev) | IN SITU & VIIRS QUAL. LEV. 5 (Bias) | IN SITU & VIIRS QUAL. LEV. 5 NO DIURNAL (Bias) |
|----------|--|---|-------------------------------------|--|
| 75 | 0.48 | 0.48 | 0.22 | 0.22 |
| 65 | 0.35 | 0.35 | 0.13 | 0.13 |
| 55 | 0.25 | 0.25 | -0.05 | -0.05 |
| 45 | 0.58 | 0.58 | 0.02 | 0.02 |
| 35 | 0.38 | 0.38 | -0.07 | -0.07 |
| 25 | 0.28 | 0.28 | 0.00 | 0.00 |
| 15 | 0.27 | 0.27 | -0.02 | -0.02 |
| 5 | 0.43 | 0.39 | 0.12 | 0.07 |
| -5 | 0.26 | 0.25 | 0.07 | 0.05 |
| -15 | 0.30 | 0.29 | 0.09 | 0.06 |
| -25 | 0.46 | 0.46 | 0.10 | 0.08 |
| -35 | 0.44 | 0.44 | 0.06 | 0.05 |
| -45 | 0.47 | 0.47 | -0.09 | -0.09 |
| -55 | 0.35 | 0.35 | 0.00 | 0.00 |



The graph displays the Analysis standard deviation and bias (K) on the Y-axis (ranging from -0.10 to 0.70) against Latitude on the X-axis (ranging from 80 to -60). Two main data series are plotted: 'IN SITU & VIIRS QUAL. LEV. 5' (red solid line with dots) and 'IN SITU & VIIRS QUAL. LEV. 5 NO DIURNAL' (blue solid line with dots). Both series show a significant peak in standard deviation and bias around 40° latitude, with the 'NO DIURNAL' series reaching a higher peak of approximately 0.70 K compared to the 'IN SITU' series at approximately 0.65 K. The 'IN SITU' series generally shows lower standard deviation and bias across most latitudes compared to the 'NO DIURNAL' series. Additionally, there are two dotted lines (red and blue) representing bias, which remain relatively low and close to zero across all latitudes, with the red dotted line showing a slight peak around 10° latitude.

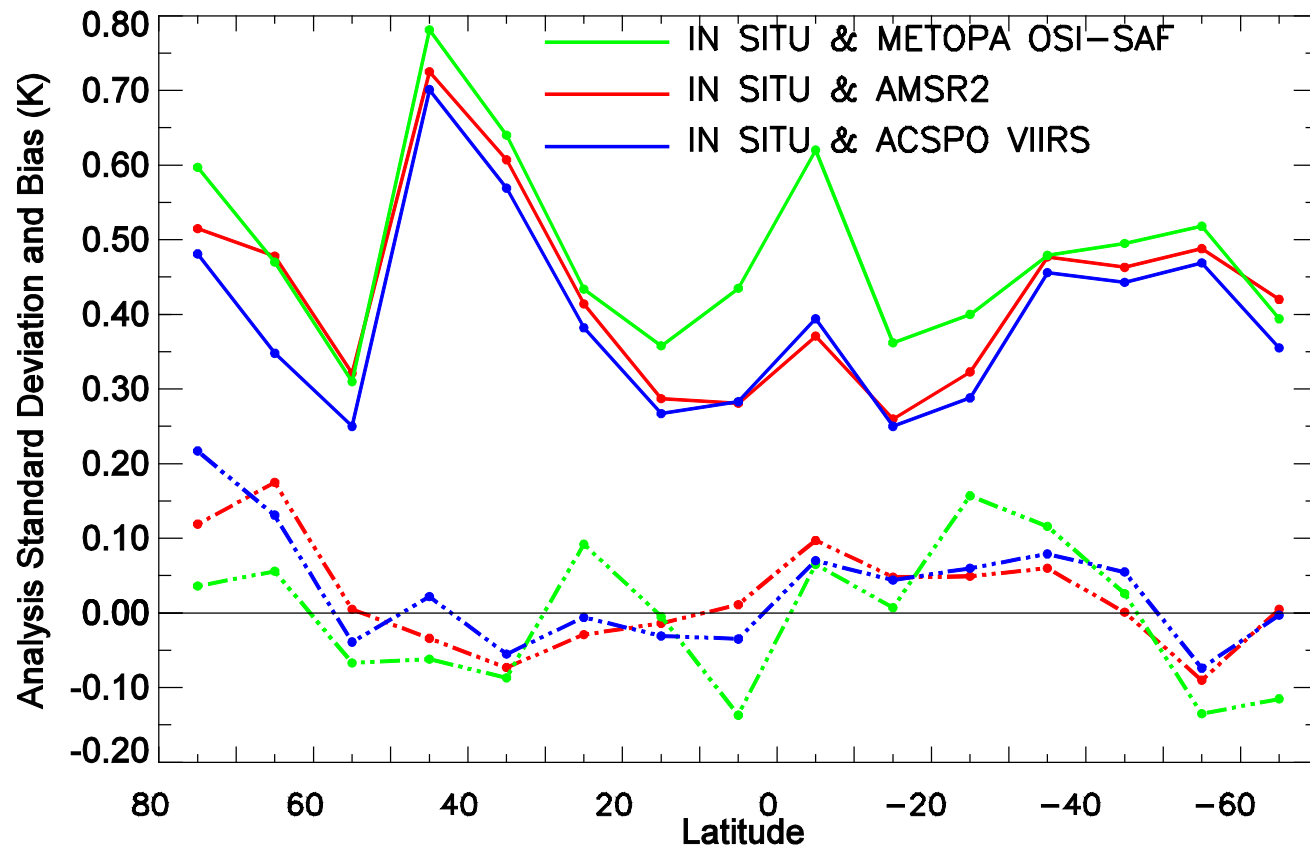
| Latitude | IN SITU & VIIRS QUAL. LEV. 5 (K) | IN SITU & VIIRS QUAL. LEV. 5 NO DIURNAL (K) | IN SITU & VIIRS QUAL. LEV. 5 BIAS (K) | IN SITU & VIIRS QUAL. LEV. 5 NO DIURNAL BIAS (K) |
|----------|----------------------------------|---|---------------------------------------|--|
| 75 | 0.48 | 0.48 | 0.22 | 0.22 |
| 65 | 0.35 | 0.35 | 0.13 | 0.13 |
| 55 | 0.25 | 0.25 | -0.05 | -0.05 |
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| -35 | 0.44 | 0.44 | 0.06 | 0.05 |
| -45 | 0.47 | 0.47 | -0.09 | -0.09 |
| -55 | 0.35 | 0.35 | 0.00 | 0.00 |

Assessing relative value of 2 VIIRS datasets: NAVO vs. ACSPO



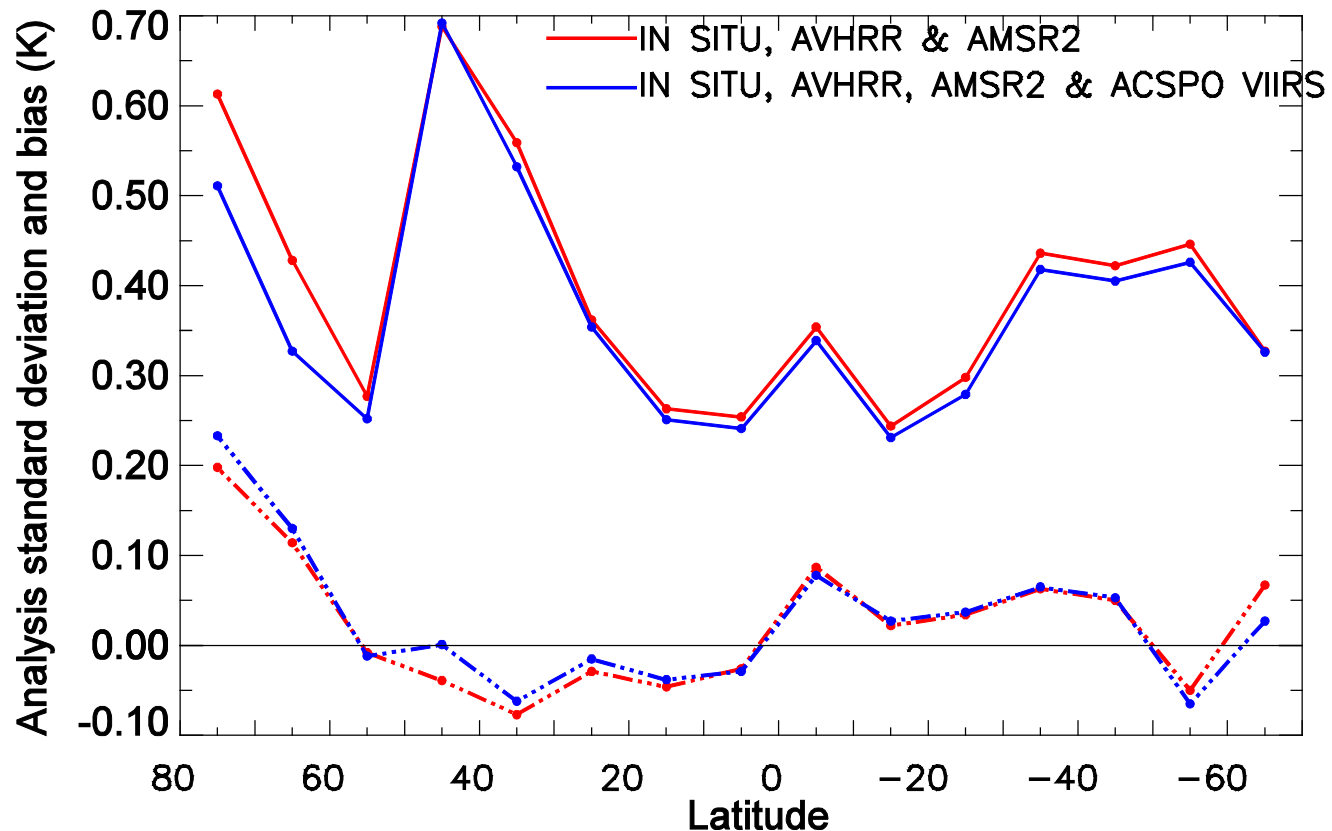
Using ACSPO instead of NAVO improves assimilation

Assessing the relative value of 3 datasets for January-March 2014



Using ACSPO improves STD in all LAT bands, except at 10°S

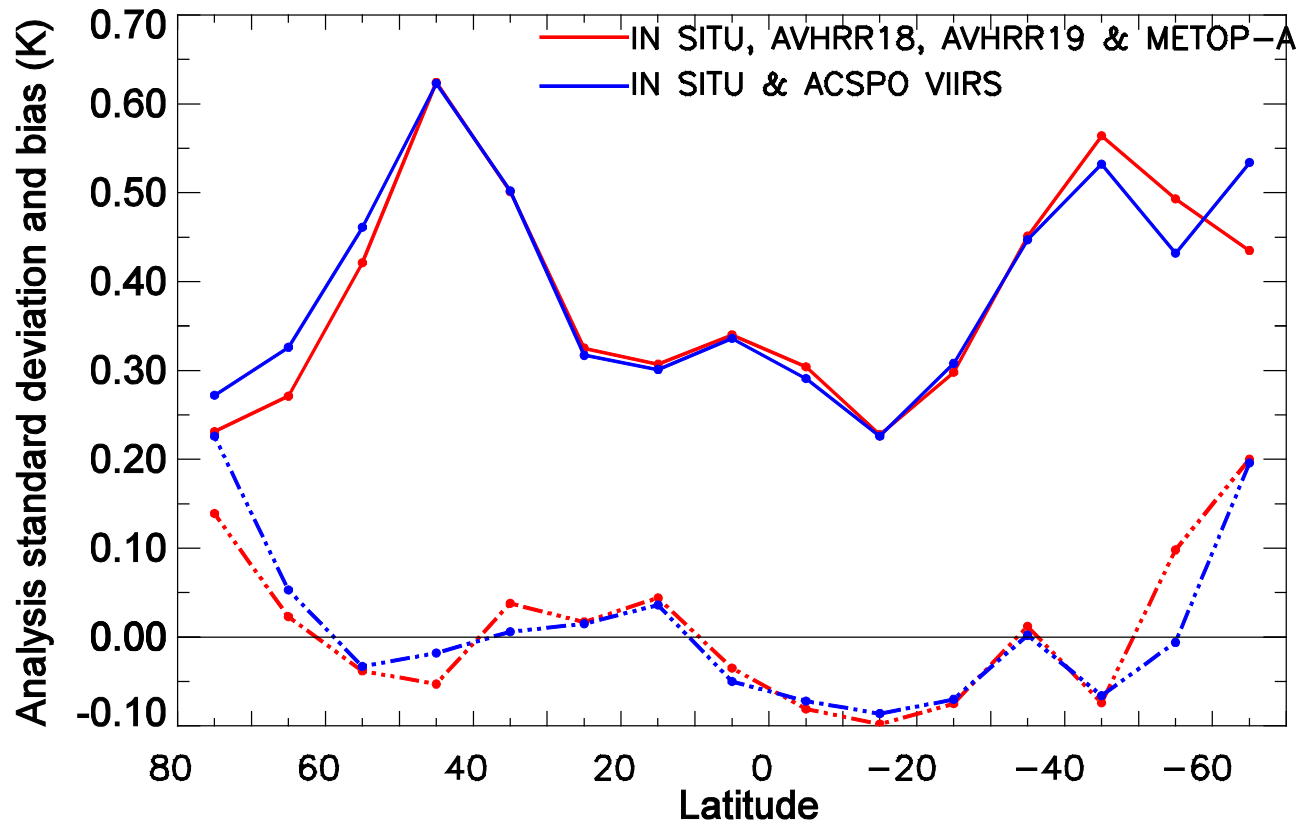
Assessing potential benefit of adding VIIRS to CMC analysis



ACSPO improves assimilation in all LAT bands, except hi-lat North (high bias)

Summer Sample: Aug. 15- Sept. 9, 2013.

VIIRS vs. NAVO AVHRR GAC



ACSPO VIIRS assimilation comparable to NAVO AVHRR, except at hi-lat

Summary

- ACSPO VIIRS L2P is an excellent product
- Based on the January – March sample, VIIRS contains more information than either the OSI-SAF MetOP-A or the RSS AMSR2 datasets
- L2P ancillary information: quality level flags and wind speeds are useful but experiment with SSES bias estimates was inconclusive
- Current plan at CMC is to assimilate ACSPO VIIRS L2P dataset when it becomes available