Use of ACSPO VIIRS data in CMC SST analyses

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Introduction

- CMC runs 3 SST analyses:

  - 0.2 deg. with AVHRR (v1)

  - 0.2 deg. with AVHRR, VIIRS and AMSR2 (v2)

  - 0.1 deg. with AVHRR, VIIRS and AMSR2 (v3)

- All analyses assimilate in situ observations (ships, drifting and moored buoys) and ice data

- SST analysis refers to a depth temperature (foundation SST) without diurnal variability

- CMC SST v2 and CMC SST v3 are available on PO.DAAC

- All verifications presented here are done against independent measures from Argo floats

- Observations are used only if they are between 3 m and 5 m and within four standard deviations of the climatology

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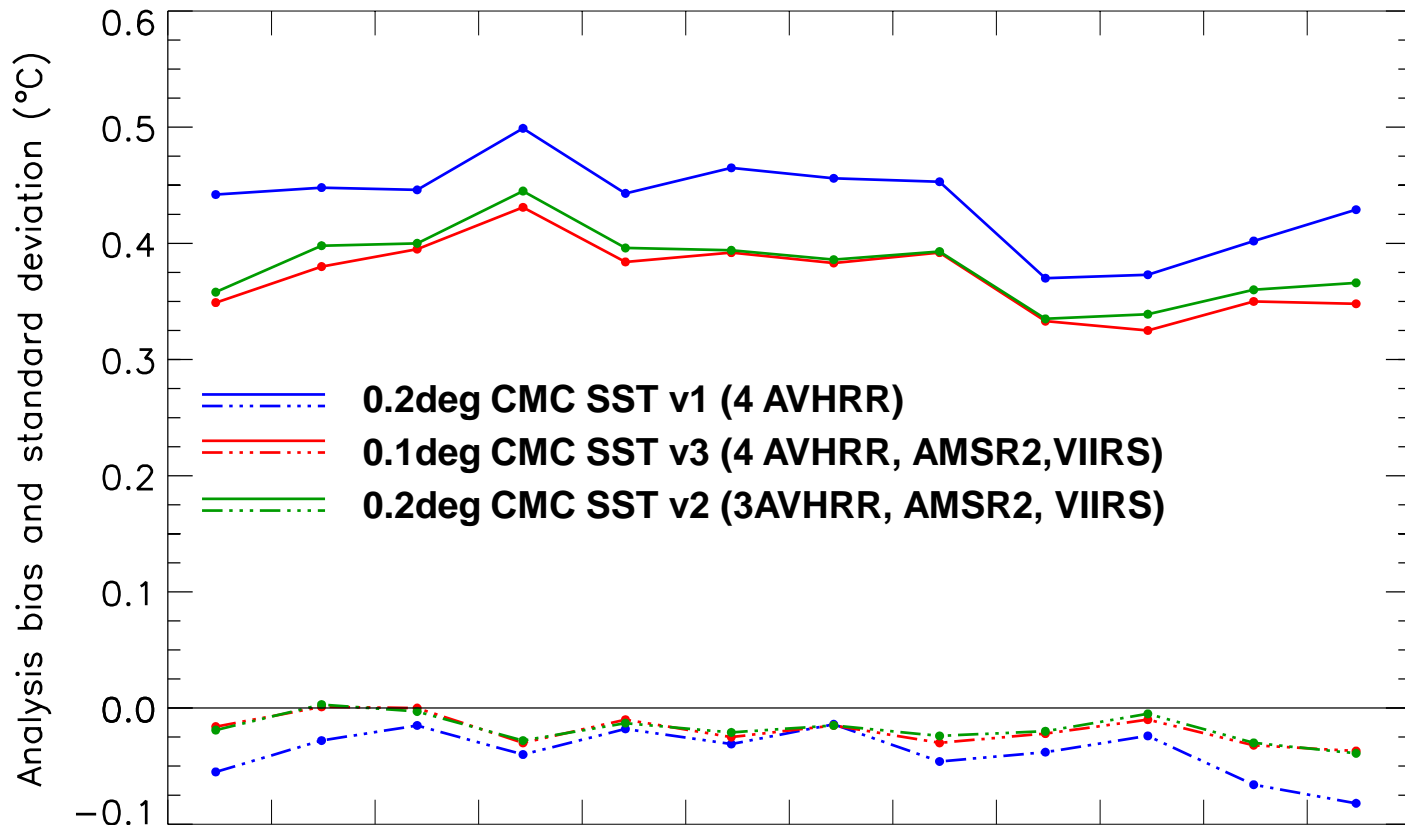
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VIIRS SST Product

- VIIRS dataset used in SST products is produced by NOAA/NESDIS using Advanced Clear-Sky Processor for Oceans - ACSPO (Petrenko et al. 2014)

- ACSPO VIIRS retrievals are in L2P format – 20G/day

- Some improvements in CMC SST 0.1deg. analysis as described in Brasnett and Surcel Colan (2016):

  - Background error correlations length scale reduced for high latitudes
  - Observations spacing reduced compared to 0.2deg SST analysis (33 km compared to 44 km at high latitudes)
  - Increased resolution of proxy data from CMC ice analysis

- No SSES bias and standard deviation from ACSPO VIIRS L2P data are used, the analysis uses in situ observations to estimate and remove the satellite bias (Brasnett 2008)
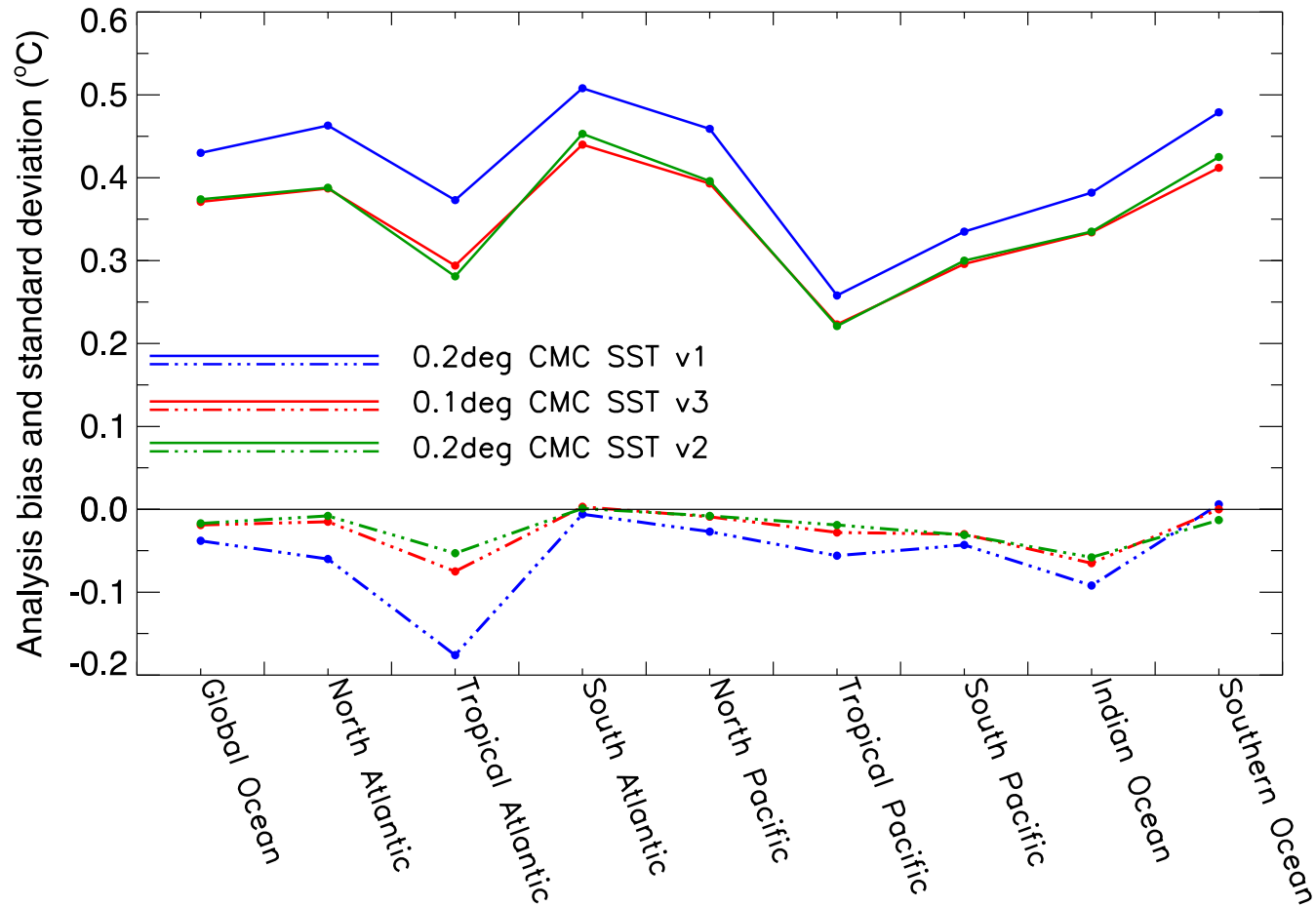
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Performance of CMC SST

Most of the reduction in analysis standard deviation results from the addition of AMSR2 and VIIRS data; changes to the analysis methodology in CMC SST v3 provide a small gain over CMC SST v2
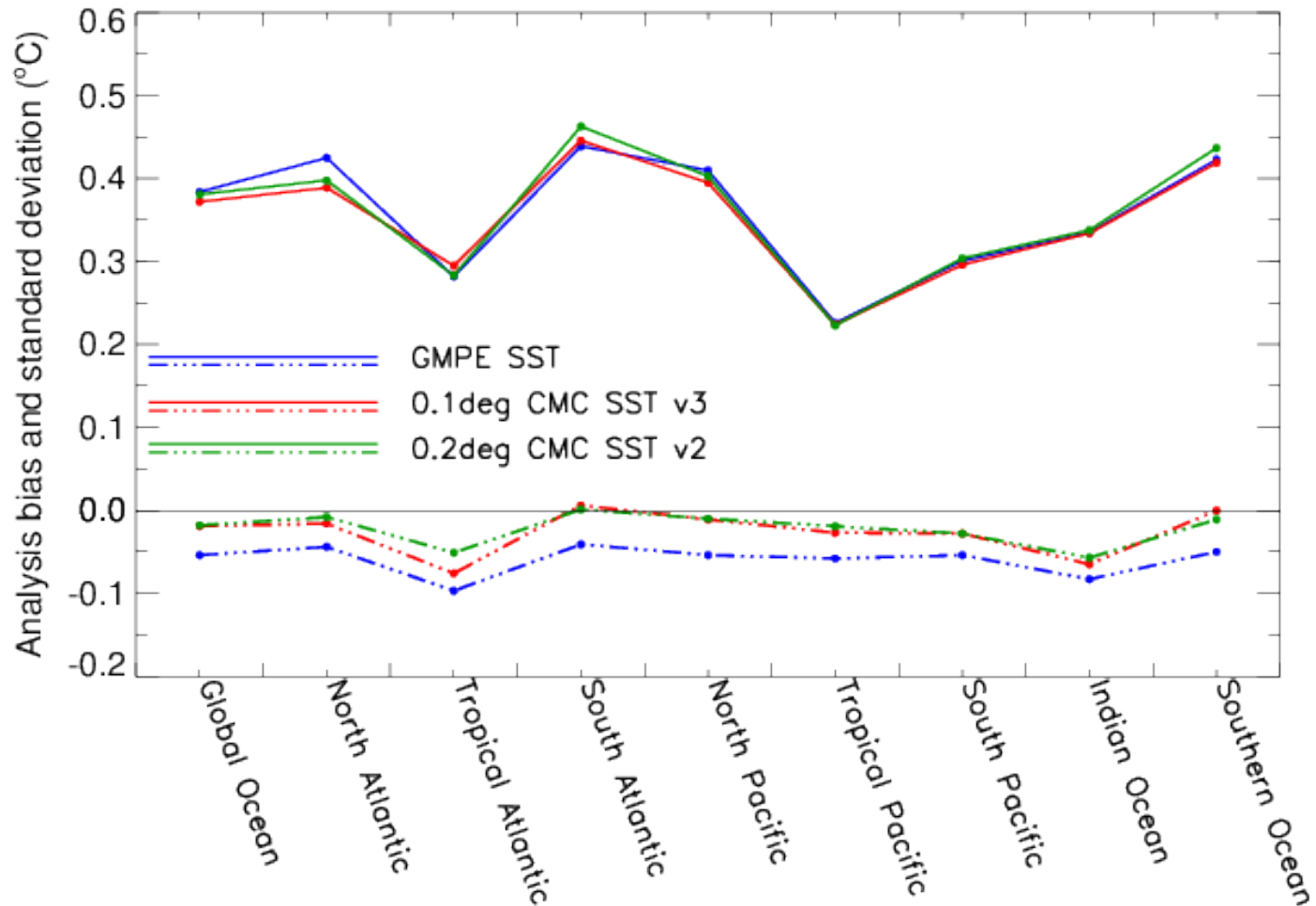
Performance of CMC SST

The reduction in standard deviation is observed over most of the regions, but over the North Atlantic, CMC SST v2 performed better in 2015

Performance of CMC SST
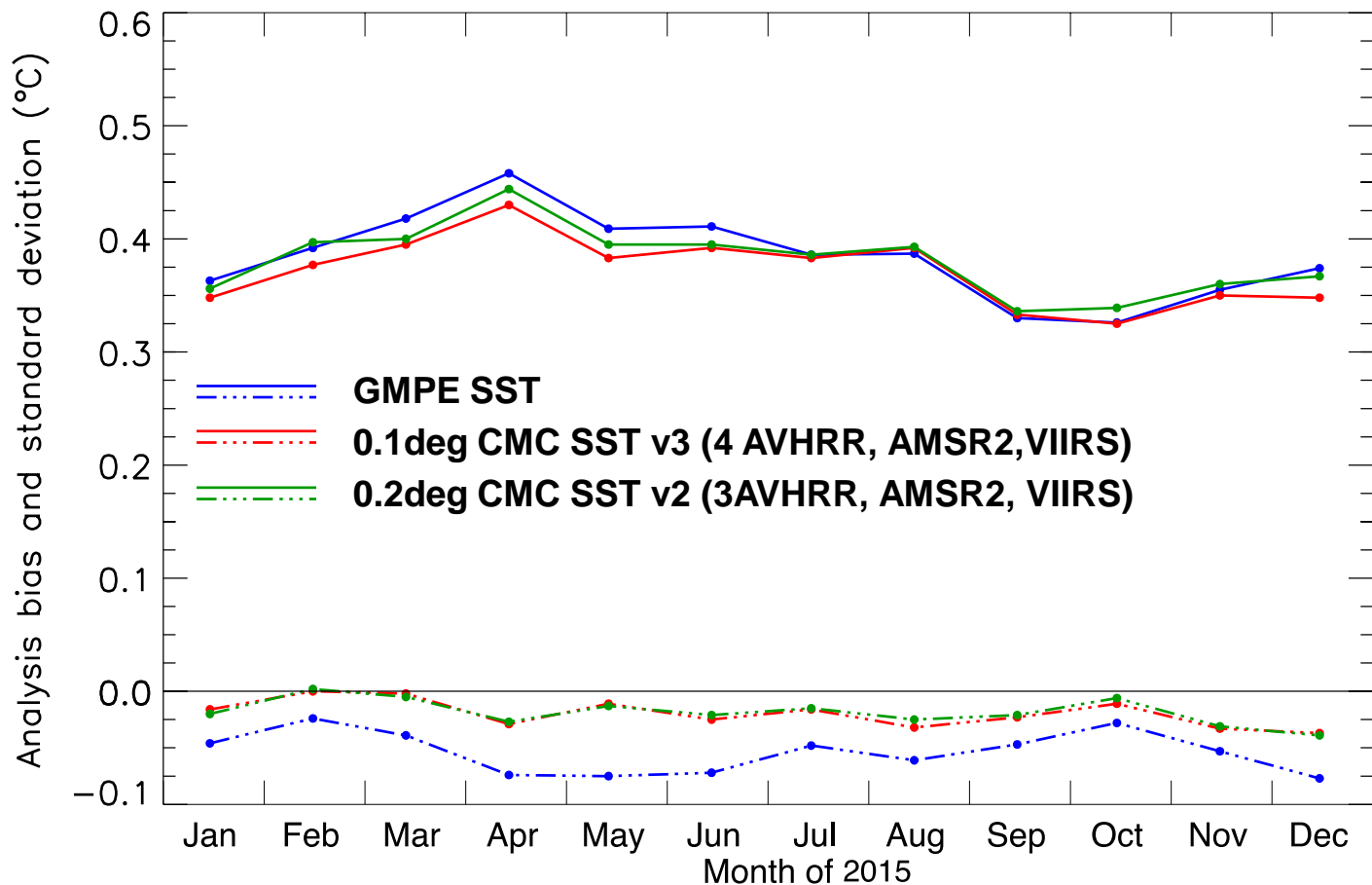
The 0.1deg analysis performs better than 0.2 deg. analysis and than GMPE product

Performance of CMC SST

GMPE product includes CMC SST v2 (assimilating VIIRS) but no other analysis assimilated VIIRS data in 2015.
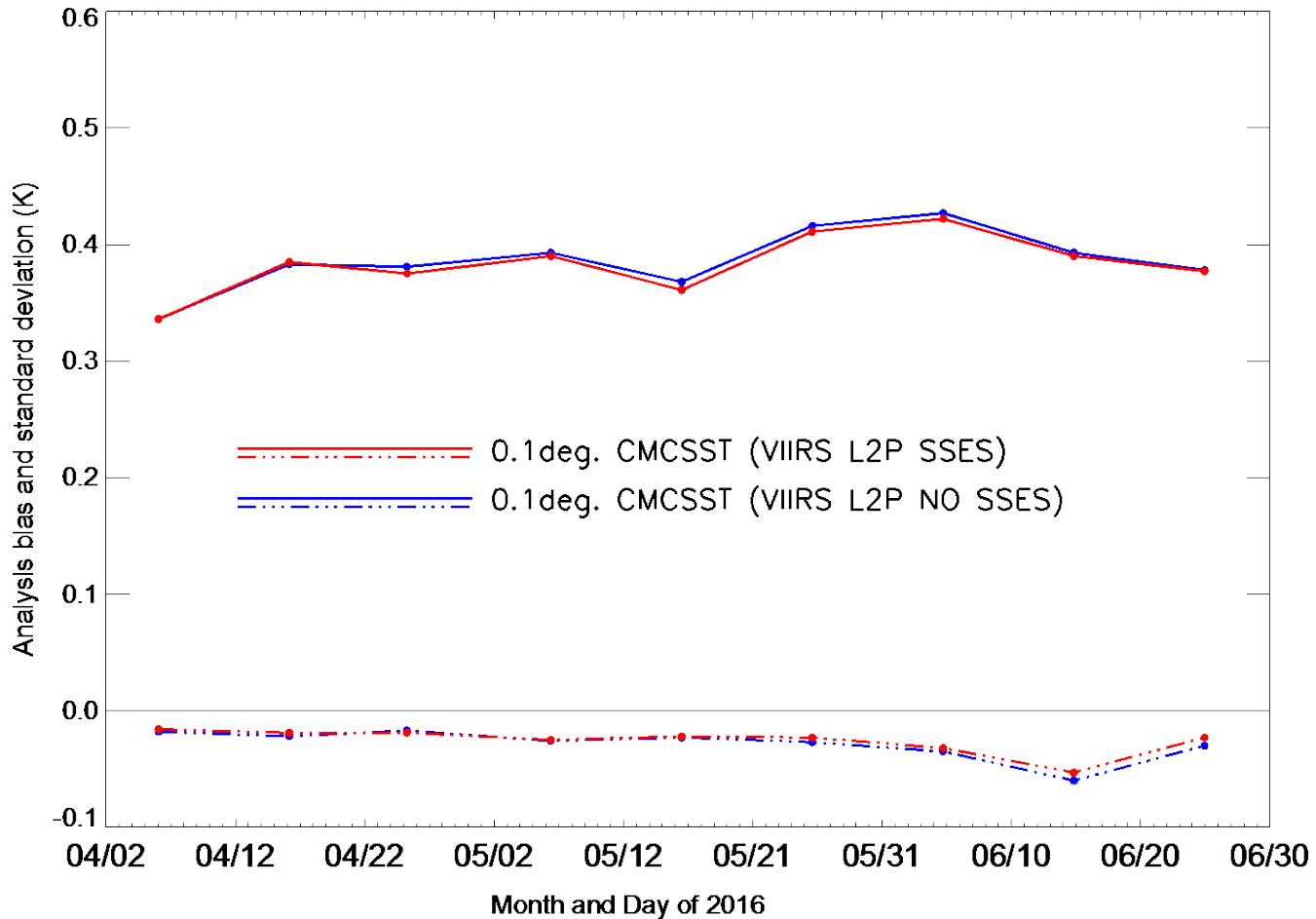
ACSPO VIIRS 2.40 – L2P, L3U

- Since May 2015 NOAA/NESDIS produces also VIIRS 2.40 in L3U format

- ACSPO VIIRS 2.40 in L3U format ~ 2G/day

- CMC SST v2 and CMC SST v3 use ACSPO VIIRS 2.40 in L2P format

- Evaluation of ACSPO VIIRS L3U have been performed for the period April – June 2016

- Tests use SST retrievals only or SST retrievals and SSES biases

- SSES bias estimates provided in L2P and L3U files for each retrievals were applied to the retrievals before use

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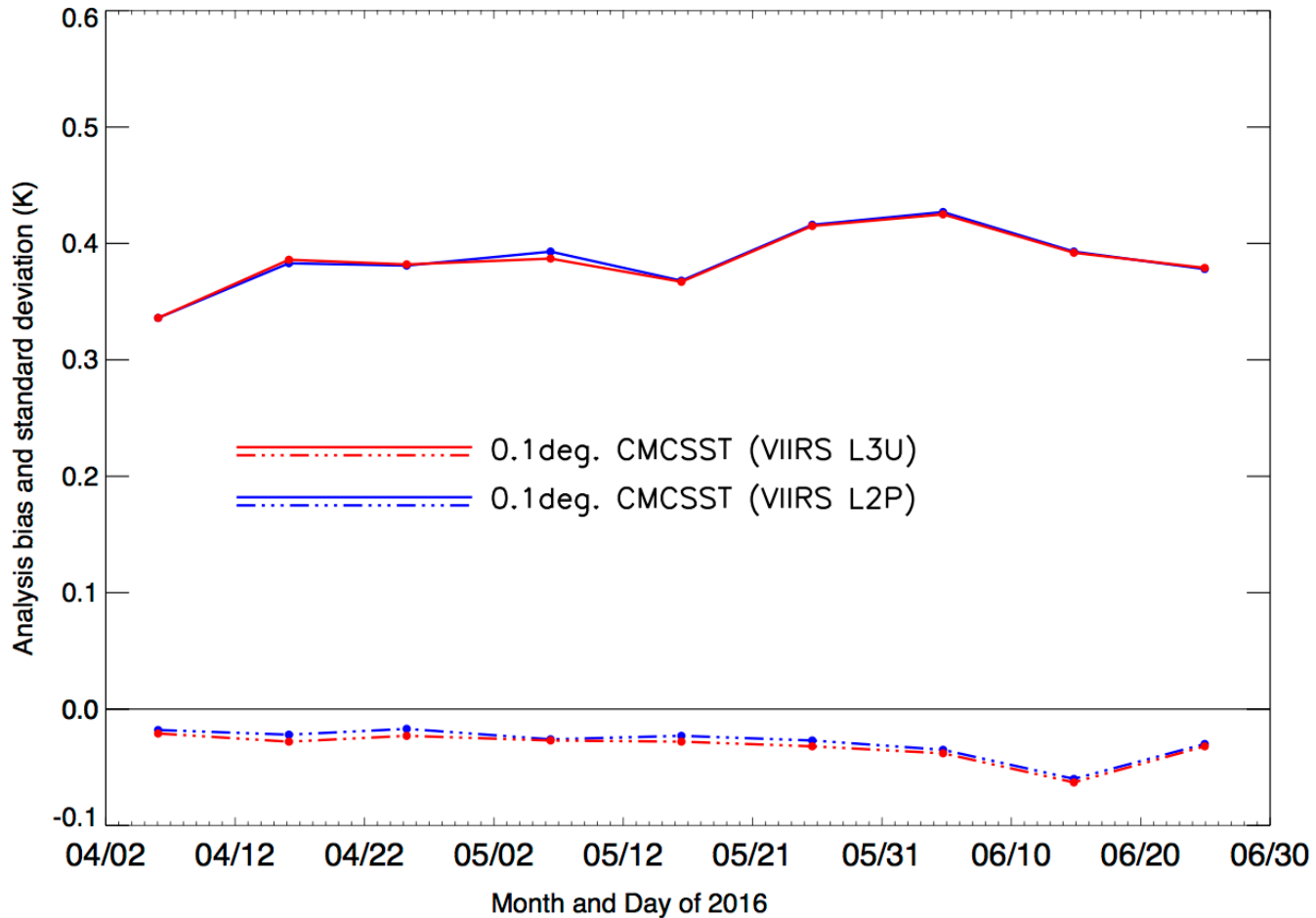Changement climatique Canada
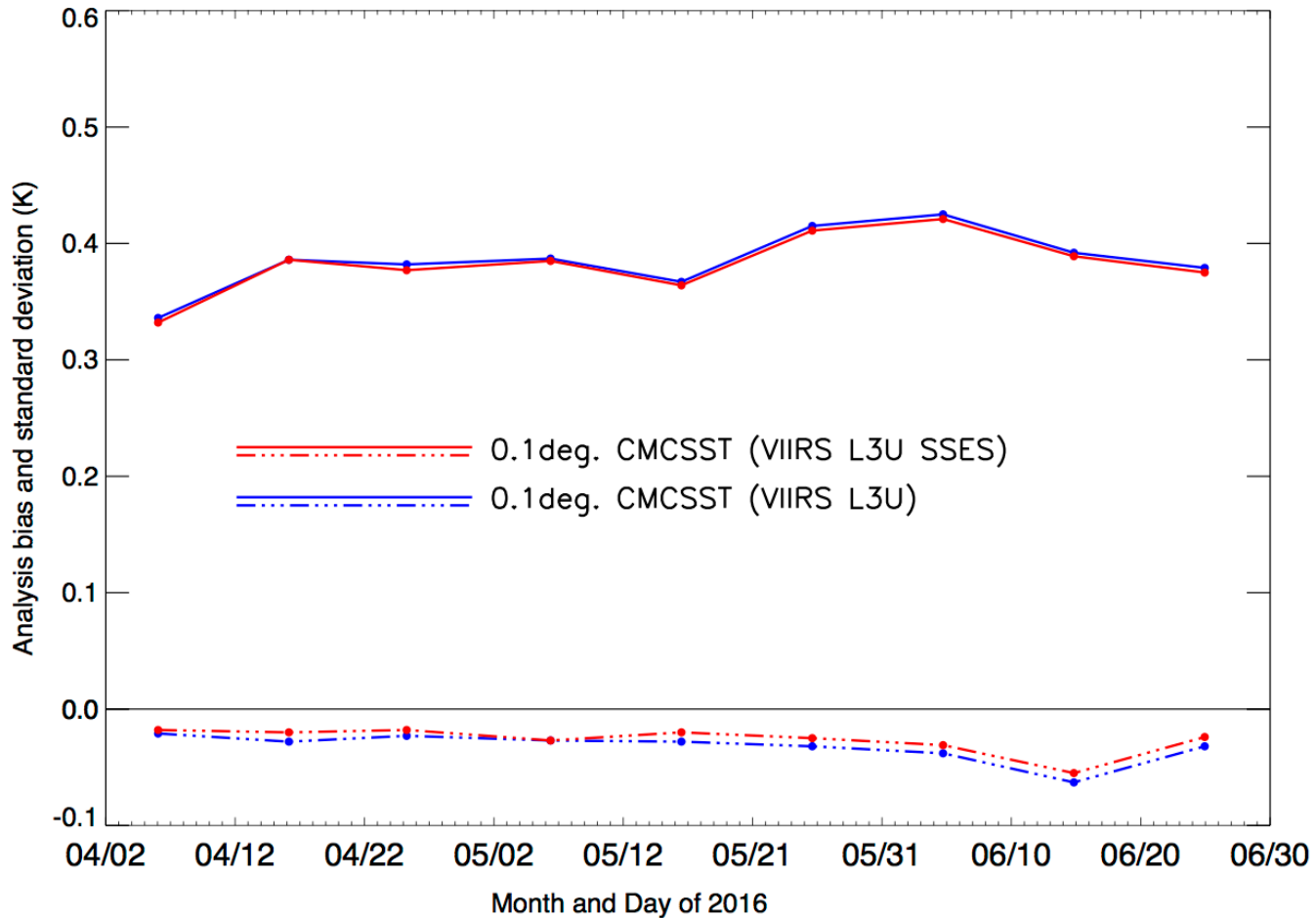
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ACSPO VIIRS L2P 2.40

Slight improvement in standard deviation error when SSES biases are used
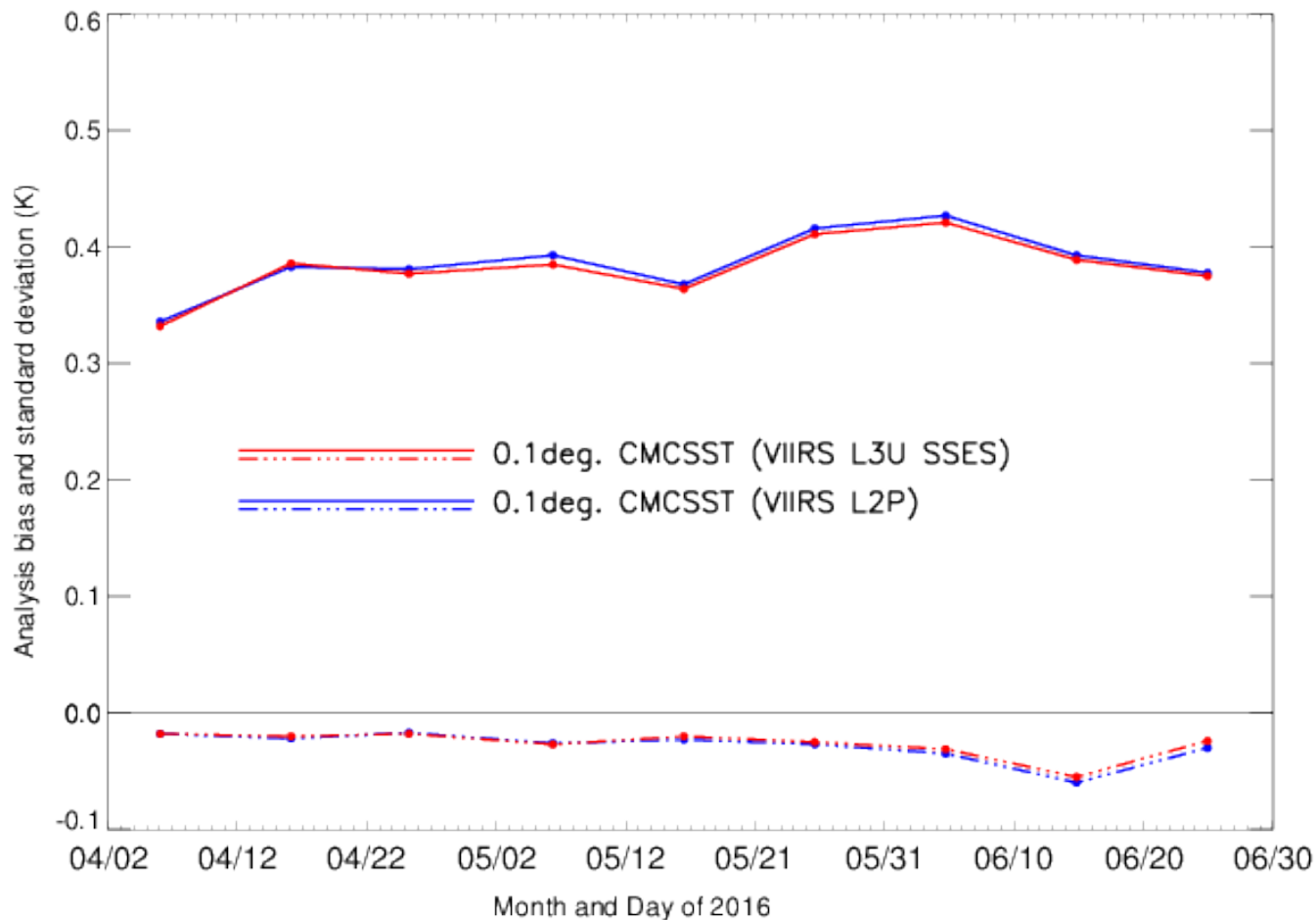
ACSPO VIIRS 2.40 L2P vs L3U

Similar performance when VIIRS ACSPO in L3U format are used

ACSPO VIIRS L3U 2.40

Slight improvement when SSES biases for VIIRS ACSPO L3U data are used

ACSPO VIIRS 2.40 L2P vs L3U SSES

Smaller standard deviation ACSPO VIIRS in L3U format with SSES biases are used

Conclusions

- The analyses using VIIRS data continue to performed well in 2015.

- Use of SSES biases produces smaller reductions in SST bias and standard deviation against ARGO measurements.

- The data in L3U format give similar results as data in L2P format, the implementation of ACSPO VIIRS L3U format is considered.

- Small but consistent improvement when SSES biases are used; tests will continue looking at regional biases over the summer/winter period.

- The 0.1 deg. CMC SST analysis which runs in experimental mode is planned to became operational in the next year. The production of 0.2 deg. CMC SST (v2) will stop in the next months.

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