The SST Quality Monitor (SQUAM)
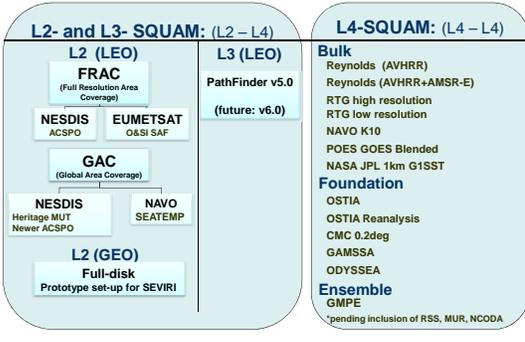
http://www.star.nesdis.noaa.gov/sod/sst/squam/

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Abstract

- The **SQUAM** is a web-based near real-time (NRT) tool to monitor level-2/3 (L2/3) satellite and level-4 (L4) analysis SST products for stability and cross consistency.

- Initially, SQUAM was developed to monitor two NESDIS AVHRR L2 products: the heritage Main Unit Task (*MUT*) and the new Advanced Clear-Sky Processor for Oceans (*ACSPO)*.

- Gradually, in collaboration with researchers from various countries and agencies, other L2/3/4 SSTs were also added.

- SQUAM analyzes statistics of deviations in SST (T_S) relative to several selected SST "reference" fields (T_R), including several L4 fields and *in situ* data.

L2- and L3- SQUAM: (L2 – L4)

L2 (LEO)
FRAC (Full Resolution Area Coverage)
NESDIS ACSPO
EUMETSAT O&SI SAF
GAC (Global Area Coverage)
NESDIS Heritage MUT Newer ACSPO
NAVO SEATEMP

L2 (GEO)
Full-disk Prototype set-up for SEVIRI

L3 (LEO)
PathFinder v5.0
(future: v6.0)

L4-SQUAM: (L4 – L4)

Bulk
Reynolds (AVHRR)
Reynolds (AVHRR+AMSR-E)
RTG high resolution
RTG low resolution
NAVO K10
POES GOES Blended
NASA JPL 1km G1SST

Foundation
OSTIA
OSTIA Reanalysis
CMC 0.2deg
GAMSSA
ODYSSEA

Ensemble
GMPE
*pending inclusion of RSS, MUR, NCODA

1. Concept

L2- and L3-SQUAM

- Customarily, satellite and analysis SSTs products are validated against *in situ* SSTs. However, *in situ* data are sparse, geographically biased, of non-uniform and often suboptimal quality, and not available in NRT.

- In addition to *in situ* data, SQUAM also employs validation against L4 fields, which cover the full global SST domain, with a more uniform quality, and are available in NRT.

- SST monitoring is done in difference space: $\Delta T_S = T_S - T_R$.

- PDFs of ΔT_S are near-Gaussian (although T_S and T_R are skewed). Diagnostics are produced using ΔT_S maps, histograms, time series, dependencies, & Hovmöller plots.

- Fig. 1 shows example diagnostics of *MetOp-A FRAC* and Fig.2 shows example for MSG2 SEVIRI.

L4-SQUAM

- Similar to L2-SQUAM, monitoring is done in difference space: $\Delta T_S = L4-L4$. Diagnostics are based on ΔT_S maps, histograms, time series of statistical parameters, and Hovmöller diagrams.
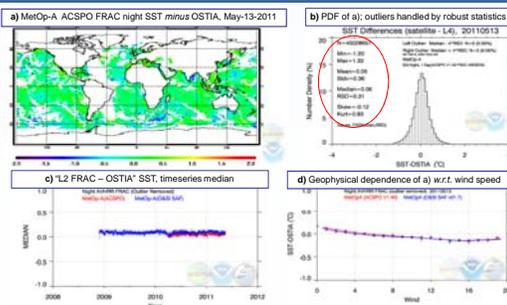
2. Polar Analyses (AVHRR FRAC)

Fig. 1: L2-SQUAM diagnostics for MetOp-A FRAC SST *w.r.t.* OSTIA.
(more analyses at: **http://www.star.nesdis.noaa.gov/sod/sst/squam/FRAC**)

3. Geostationary Analyses (SEVIRI)
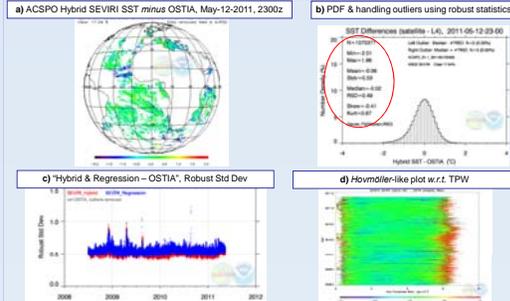
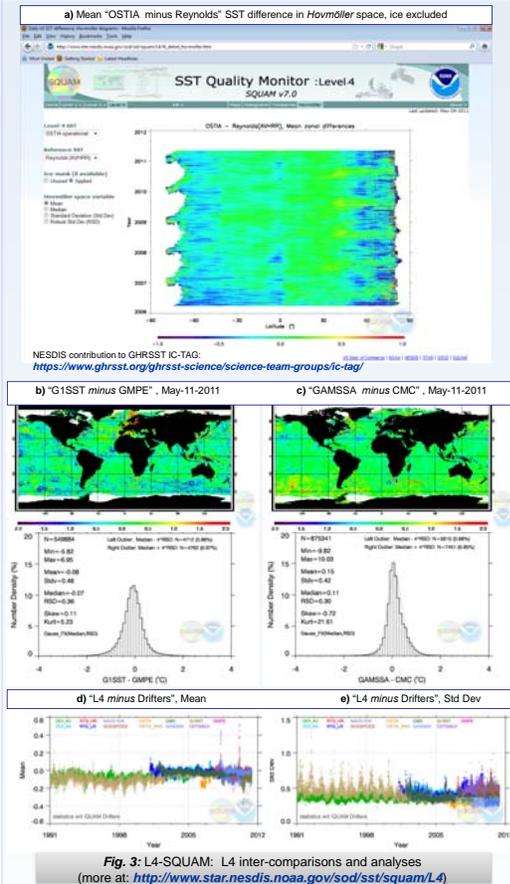**Fig. 2:** L2-SQUAM diagnostics for ACSPO SEVIRI SST *w.r.t.* OSTIA.
(more analyses at: **http://www.star.nesdis.noaa.gov/sod/sst/squam/SEV**)

4. L4 inter-comparison

NESDIS contribution to GHRSST IC-TAG:
https://www.ghrsst.org/ghrsst-science/science-team-groups/ic-tag/

Fig. 3: L4-SQUAM: L4 inter-comparisons and analyses
(more at: **http://www.star.nesdis.noaa.gov/sod/sst/squam/L4**)

5. Summary

- SST Quality Monitor (SQUAM) was set up to monitor various SST products online in NRT, check them for self- and cross-consistency, and validate against QCed *in situ* SST.
- SQUAM currently monitors all major AVHRR products, and 13 L4 products. Adding other polar L2s and L3s (MODIS, ATSR, AMSR-E) and remaining L4s is underway.
- Adding geostationary L2 products from MSG, GOES, and MTSAT is underway.
- SST products from future JPSS and GOES-R systems will be added in SQUAM when available, and checked for consistency and improvements w.r.t. heritage SST products.

6. Future Work

- L2/3-GEO: Finalize SEVIRI; Add O&SI SAF & NESDIS Operational GOES and MTSAT SST.
- L2/3- LEO: Add VIIRS (once available), MODIS, ATSR, AMSR-E, Pathfinder v6.0.
- L4: Add remaining major L4 products: RSS, NCODA, JPL MUR.
- Report finding and work towards reconciliation of various SST products.

Acknowledgments & Disclaimer