SST from GOES-R and JPSS: Algorithms, Products, Cal/Val and Monitoring

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NESDIS/STAR is responsible for the development and maintenance of sea surface temperature (SST) algorithms and products for the GOES-R and the Joint Polar Satellite Series (JPSS). STAR also supports SST calibration and validation, and online near-real time monitoring. The Suomi National Partnership Program (NPP) satellite launched in October 2011 provides a link between the NOAA POES, NASA EOS and JPSS Programs. Operational JPSS-1 and -2 satellites are planned for launch in 2015 and 2018, and GOES-R in 2015.

STAR has developed the Advanced Clear-Sky Processor over Oceans (ACSPO) system, to process both polar and geostationary data. ACSPO runs the Community Radiative Transfer Model (CRTM), in conjunction with first guess SST (Reynolds) and upper air (NCEP GFS) fields, to generate clear-sky TOA brightness temperatures (BTs) in SST bands. Simulated BTs are used for improved cloud screening, SST retrievals, and validation of satellite radiances and CRTM. The major ACSPO product is clear-sky ocean BTs in all sensor bands, which can be used for NWP radiance assimilation. From emission bands, SST is estimated and reported in ACSPO products granules. From visible bands, aerosol or ocean color can be estimated.

ACSPO has been operational at NESDIS since May 2008, with AVHRR GAC (4km) and FRAC (1km) global data. ACSPO products are archive in NOAA Comprehensive Large Array-data Stewardship System (CLASS; www.class.noaa.gov). Additionally, ACSPO is run in STAR in near-real time, with global data from Terra and Aqua MODIS, and MSG/SEVIRI, used as a proxy for JPSS and GOES-R. Once data in VIIRS emission bands became available in January 2012, they have been also included in routine processing at STAR. Note that the official SST Environmental Data Record (EDR) product is produced by the Interface Data Processing Segment (IDPS) run by Raytheon. Analyses of both products (IDPS and ACSPO) offers insight into their relative performance and potential areas for improvement.

Routine monitoring and validation of all generated SST products is performed by the online SST Quality Monitor (SQUAM; http://www.star.nesdis.noaa.gov/sod/sst/squam/) system, in near-real time. Analyses

are performed for deviations of retrieved SST from a reference SST, ΔT_S. Two types of references are used in SQUAM: (a) global first guess SST fields, provided by Level 4 analyses (Reynolds, OSTIA, etc); and (b) quality controlled (QC'ed) *in situ* SST. Maps illustrate global coverage, and check if the ΔT_S are near-zero, with no large outliers and anomalies. Global histograms of ΔT_S check for a proximity to a Gaussian shape, centering at zero. Relative widths of the histograms from different products (sensors, platforms, ...) are indicative of RMS errors in the corresponding retrieved SSTs. Time series of all Gaussian parameters and Hovmoller diagrams are plotted, to check for product stability in time and space. Also, global ΔT_S are plotted as functions of retrieval conditions (view zenith angle, total perceptible water vapor, wind speed etc) to check for artificial dependencies in the retrievals. To ensure the internal consistency GOES-R and JPSS products and place them in context of other similar available national and international SST products, SQUAM displays them side-by-side to facilitate their relative cross-comparisons.

The *in situ* SSTs used in SQUAM come from another online near real time system, the in situ Quality monitor (*i*Quam; http://www.star.nesdis.noaa.gov/sod/sst/iquam/), which performs three major functions: 1) quality controls in situ SST data, using the community consensus QC procedures; 2) monitors QC'ed data online; and 3) distributes QC'ed in situ data to outside users via the web portal. The *iQuam* has been identified as the source of in situ data for the Cal/Val in both JPSS and GOES-R SSTs.

The third online near time system, Monitoring of IR Clear-sky radiances over Oceans for SST (MICROS; http://www.star.nesdis.noaa.gov/sod/sst/micros/) monitors clear-sky sensor BTs in SST bands, against the CRTM simulated BTs. By ensuring stability and cross-platform consistency of all BTs used for SST retrievals, MICROS serves several groups of users.

This presentation discusses JPSS and GOES-R SST algorithms and products as implemented in ACSPO, and their Cal/Val and monitoring using SQUAM, iQuam, and MICROS near-real time online tools.

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References

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