JPSS SST Products

Alexander Ignatov, John Stroup, Yury Kihai, Xingming Liang, Boris Petrenko, Prasanjit Dash, Irina Gladkova, Marouan Bouali, Karlis Mikelsons, John Sapper, Feng Xu, Xinjia Zhou

NOAA; CIRA; GST Inc; CUNY
## JPSS SST Team

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<tr>
<th>Name</th>
<th>Affiliation</th>
<th>Funding</th>
<th>Tasks</th>
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<td><strong>Ignatov</strong></td>
<td>STAR</td>
<td>NOAA</td>
<td>Lead, JPSS Algorithm &amp; Cal/Val</td>
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<tr>
<td>Stroup, Kihai, Dash, Liang, Petrenko, Xu, Bouali, Zhou, Gladkova, Mikelsons</td>
<td>STAR/CIRA STAR/STG STAR/GST STAR/GST</td>
<td>JPO, NOAA ORS, GOES-R, NASA</td>
<td>Monitoring, VAL, comparison of SSTs (SQUAM), Radiances (MICROS), in Situ SSTs (iQuam), Users support; IDPS-SST code, ACSPO code and products (L2, L3); Match ups w/iQuam; Destriping and other L1b fixes; Algorithms improvements: Clear-Sky Mask, SST</td>
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<tr>
<td><strong>May</strong>, Cayula, McKenzie, Willis</td>
<td>NAVO</td>
<td>Navy, NJO</td>
<td>NAVO SEATEMP SST &amp; Cal/Val VIIRS Cloud Mask evaluation in IDPS and comparisons with NAVO Cloud Mask</td>
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<tr>
<td><strong>Minnett</strong></td>
<td>U. Miami</td>
<td>JPO, U. Miami</td>
<td>Uncertainty &amp; instrument analyses; RTM; VAL vs. drifters &amp; radiometers; skin to sub-skin conversion; high-latitude and full swath focus</td>
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<tr>
<td>Kilpatrick</td>
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<td><strong>Arnone</strong></td>
<td>USM/NRL UCSD</td>
<td>NJO, USM</td>
<td>SST Algorithm Analyses, SST improvements at slant view zenith angles/swath edge; SST consistency from multiple passes</td>
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<td>Fargion</td>
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<td><strong>LeBorgne</strong></td>
<td>Meteo France</td>
<td>EUMETSAT</td>
<td>Processing VIIRS and Cal/Val using O&amp;SI SAF heritage; Comparisons with AVHRR/SEVIRI</td>
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<td>Roquet</td>
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Acknowledgements

- ACSPO Users
  - NOAA: CRW, NOS, CW, geo-polar blend, NCDC
  - (Inter)national Users – CMC, BoM, UK MO, JMA, DMII, JPL

- JPSS Program – Mitch Goldberg, Kathryn Schontz, Bill Sjoberg

- NASA SNPP Project Scientist – Jim Gleason

- NOAA NDE Team – Tom Schott, Dylan Powell, Bonnie Reed

- JPSS DPA – Eric Gottshall, Janna Feeley, Bruce Gunther

- VIIRS SDR & GSICS – Changyong Cao, Frank DeLuccia, Jack Xiong, Mark Liu, Fuzhong Weng

- NESDIS/STAR JPSS Team – Ivan Csiszar, Lihang Zhou, Paul DiGiacomo, many others

- NOAA CRTM Team – Yong Han, Yong Chen, Mark Liu
**VIIRS SST Products**

**IDPS** – NOAA Interface Data Processing Segment (IDPS)
- Official NPOESS SST EDR, Now owned by NOAA JPSS PO
- Developed by NGAS; Operational at Raytheon; archived at NOAA CLASS
- Jan 2014: JPO recommends to “discontinue the IDPS EDR, concentrate on ACSPO sustainment, development, and Cal/Val”
- IDPS will be phased out as soon as ACSPO SST is archived at JPL/NODC

**ACSPO** – NOAA Advanced Clear-Sky Processor for Ocean (ACSPO)
- NOAA heritage SST system
- Operational with global AVHRR 4km-GAC & 1km-FRAC
- Terra/Aqua MODIS & S-NPP VIIRS – experimental Jan’2012
- SNPP VIIRS – operational Mar 2014, GDS2 archival at JPL/NODC underway

**NAVO** – SEATEMP
- Builds on NAVO AVHRR & NOAA pre-ACSPO heritage
- Transitioned from NOAA to NAVO in 1994, “Shared Processing Agreement”
- Operational with S-NPP since Mar 2013
- GDS2 archived at JPL/NODC since May 2013
Objective & Methodology

- **Objective:** Compare ACSPO and NAVO SSTs to advise users on the specifics of the two products.

- **Methodology:** Compare ACSPO/NAVO SST domain & performance against two global reference SSTs:
  - L4 SST (Canadian Met Centre CMC0.2 Analysis. Note that VIIRS data are not assimilated in CMC0.2)
  - *in situ* SST (QCed drifting buoys in iQuam [www.star.nesdis.noaa.gov/sod/sst/iquam/](http://www.star.nesdis.noaa.gov/sod/sst/iquam/))

**Data:** one representative day of global data
NIGHT: ACSPO L2 minus CMC L4
23 April 2014

SST-CMC NPP 20140423 Night ACSPO V2.30

- Delta close to zero as expected
- Cold spots – Residual Cloud/Aerosol leakages
NIGHT: NAVO L2 minus OSTIA L4
23 April 2014

SST-CMC VIIRS 20140423 Night NAVO NPP v02.0

• Retrievals limited to VZA<54°
NIGHT: ACSPO L2 minus CMC L4
23 April 2014

SST-CMC opr, 20140423

- N = 115860235
- Min = -4.57
- Max = 7.60
- Mean = 0.02
- Stdv = 0.38
- Median = 0.02
- RSD = 0.30
- Skew = 1.46
- Kurt = 17.13
- Gauss_Fit (Median, RSD)

Left Outlier: Median - 4*RSD: N = 476956 (0.41%)
Right Outlier: Median + 4*RSD: N = 819874 (0.71%)

Night, ACSPO V2.30 VIIRS (NESDIS)

*Shape close to Gaussian*
NIGHT: NAVO L2 minus CMC L4
23 April 2014

• Shape close to Gaussian
• Domain smaller, STD slightly better
NIGHT: ACSPO L2 minus *in situ* SST
23 April 2014

- Much sparser data coverage
- Not fully representative of the globe
NIGHT: NAVO L2 minus *in situ* SST
23 April 2014

- Much sparser data coverage
- Not fully representative of the globe
NIGHT: ACSPO L2 minus \textit{in situ} SST
23 April 2014

- Shape close to Gaussian – small cold tail
- Performance Stats well within specs (Bias<0.2K, STD<0.6K)
NIGHT: NAVO L2 minus *in situ* SST
23 April 2014

- Shape close to Gaussian – small cold tail
- Performance Stats well within specs (Bias<0.2K, STD<0.6K)
### NIGHT – Summary

#### ΔT = “VIIRS minus CMC” SST (expected ~0)

<table>
<thead>
<tr>
<th>NCBS (%ACSPO)</th>
<th>Min/ Max</th>
<th>Mean/ STD</th>
<th>Med/ RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IDPS</strong></td>
<td>116.8M (101%)</td>
<td>-13.1/+12.6</td>
<td>-0.04/0.46</td>
</tr>
<tr>
<td><strong>ACSPO</strong></td>
<td>115.9M (100%)</td>
<td>-4.6/+7.6</td>
<td>-0.02/0.38</td>
</tr>
<tr>
<td><strong>NAVO</strong></td>
<td>39.5M (34%)</td>
<td>-8.9/+7.1</td>
<td>+0.04/0.37</td>
</tr>
</tbody>
</table>

- **IDPS**: SST domain is +1% larger than ACSPO, All stats degraded
- **NAVO**: SST domain is factor of ×3 smaller than ACSPO, stats improved

#### ΔT = “VIIRS minus in situ” SST (expected ~0)

<table>
<thead>
<tr>
<th>NCBS (%ACSPO)</th>
<th>Min/ Max</th>
<th>Mean/ STD</th>
<th>Med/ RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IDPS</strong></td>
<td>2,082 (113%)</td>
<td>-2.9/+5.6</td>
<td>-0.06/0.43</td>
</tr>
<tr>
<td><strong>ACSPO</strong></td>
<td>1,846 (100%)</td>
<td>-1.7/+1.3</td>
<td>-0.02/0.28</td>
</tr>
<tr>
<td><strong>NAVO</strong></td>
<td>678 (37%)</td>
<td>-2.3/+1.0</td>
<td>+0.02/0.29</td>
</tr>
</tbody>
</table>

- **IDPS**: SST domain is +13% larger than ACSPO, All stats degraded
- **NAVO**: SST domain is factor of ×3 smaller than ACSPO, stats comparable

13 May 2014

JPSS SST Products
### ΔT = “VIIRS minus CMC” SST (expected ~0)

<table>
<thead>
<tr>
<th>NOBS (%ACSPO)</th>
<th>Min/ Max</th>
<th>Mean/ STD</th>
<th>Med/ RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDPS 120.4M (100%)</td>
<td>-28.7/+10.4</td>
<td>+0.20/0.77</td>
<td>+0.24/0.45</td>
</tr>
<tr>
<td>ACSPO 121.0M (100%)</td>
<td>-5.4/+9.2</td>
<td>+0.29/0.59</td>
<td>+0.21/0.41</td>
</tr>
<tr>
<td>NAVO 41.3M (34%)</td>
<td>-8.2/+7.5</td>
<td>+0.28/0.56</td>
<td>+0.22/0.40</td>
</tr>
</tbody>
</table>

- IDPS: SST domain is comparable with ACSPO, All stats degraded
- NAVO: SST domain is factor of ×3 smaller than ACSPO, stats comparable

### ΔT = “VIIRS minus in situ” SST (expected ~0)

<table>
<thead>
<tr>
<th>NOBS (%ACSPO)</th>
<th>Min/ Max</th>
<th>Mean/ STD</th>
<th>Med/ RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDPS 1,758 (105%)</td>
<td>-5.3/+2.7</td>
<td>-0.06/0.77</td>
<td>+0.10/0.48</td>
</tr>
<tr>
<td>ACSPO 1,680 (100%)</td>
<td>-1.4/+2.8</td>
<td>+0.07/0.42</td>
<td>+0.06/0.37</td>
</tr>
<tr>
<td>NAVO 510 (30%)</td>
<td>-1.2/+2.1</td>
<td>+0.12/0.35</td>
<td>+0.07/0.35</td>
</tr>
</tbody>
</table>

- IDPS: SST domain is +5% larger than ACSPO, All stats degraded
- NAVO: SST domain is factor of ×3 smaller than ACSPO, stats improved
Missed lines?

Rectangular shapes?

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Too-Regular shapes?

India

SEATEMP
Missed lines?

Tri-angular shape?
Conclusion and Near-Future Work

ACSPO and NAVO are two VIIRS SST choices for users

- Both are GDS2, available (or shortly to be) via JPL/NODC
- ACSPO retrieval domain is larger than NAVO, by a factor of ~3, due to NAVO narrow swath VZA<54°, conservative cloud mask
- NAVO STDs are smaller than ACSPO by a narrow margin

Near-Term ACSPO tasks

- Work with users, solicit feedback, improve ACSPO
- Implement destriping operationally (Karlis Mikelsons)
- Pattern recognition ACSPO Clear-Sky Mask (Irina Gladkova)
- Focus on high-latitudes
- Focus on improved Quality Flags and Levels
- Generate L3 ACSPO product – many users requests
- Establish reprocessing and back-fill ACSPO VIIRS to Jan’2012