Variability in Satellite SST Data

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Topics

- Global 1 degree comparisons between AVHRR SST data sets
- “Performance characteristics” of SST data sets using *in situ* observations
- Future work: Comparisons among other satellite datasets
Data Sources

AVHRR satellite SST
- Modified Pathfinder SST (MPSST)
- Operational NOAA SST (ONSST)

Analysis SST
- NOAA Optimal Interpolation SST (OISST)
- and others ...... (2DVAR, HADISST, GISST)
Comparison methodology

- Globally regrid daily satellite SST data to 1 degree resolution on monthly time scales for 1985-1997.
- Determine the monthly differences between SST data sets on common 1 degree squares.
- For the entire time series, compute standard statistics for differences on monthly scales for mean bias, RMS, correlation etc.
- Daytime and nighttime satellite results compared separately.
- Caveat: Map results depicted here will be based on statistics for the entire data set, i.e., there is no monthly component.
Daytime bias maps

MPSST-OISST

ONSST-OISST
Nighttime bias maps

MPSST-OISST

ONSST-OISST
Monthly averaged bias values (60N-60S)

**Day**

![Daytime bias graph]

**Night**

![Nighttime bias graph]
Daytime RMS maps

MPSST-OISST

ONSST-OISST
Nighttime RMS maps

MPSST-OISST

ONSST-OISST
Monthly averaged RMS values
(60N-60S)

Day

Night
Monthly anomaly time series

Time series of monthly MPSST, ONSST, and OISST minus WOA98 climatological SST.

Satellite data are nighttime values.
### SST time series stats: SST data (85-90, 93-97) - WOD98 in situ SST

<table>
<thead>
<tr>
<th></th>
<th>Pathfnr SST</th>
<th></th>
<th>NOAA SST</th>
<th></th>
<th>OI SST</th>
<th></th>
<th># obs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td>K</td>
</tr>
<tr>
<td><strong>60N-60S</strong></td>
<td>-0.16</td>
<td>1.18</td>
<td>0.09</td>
<td>1.27</td>
<td>0.02</td>
<td>1.19</td>
<td>530K</td>
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<td>1.40</td>
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<td>0.07</td>
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<td><strong>20S-60S</strong></td>
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<td>0.91</td>
<td>0.0</td>
<td>1.0</td>
<td>-0.10</td>
<td>0.95</td>
<td>54K</td>
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Summary

Daytime MPSST-OISST bias values are closer to zero than ONSST bias values while the reverse is true at night. Nighttime MPSST appears to be biased 0.2 degC cool.

MPSST nighttime cool bias is confirmed by comparing to the independent WOA98 climatology.

RMS difference results indicate a lower value for MPSST than ONSST for daytime results, and about equal at night.

MPSST 1 degree time series reflects actual in situ SST variation (WOD98 SST) very well in the mid-high latitudes. OI SST does a better job in the low latitudes.

We are investigating comparisons of MPSST to other datasets such as ATSR SST and MODIS SST.
### Pathfinder SST – ATSR2 SST statistics

<table>
<thead>
<tr>
<th>Pass</th>
<th>Mean (°C)</th>
<th>Std Dev (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime</td>
<td>0.51</td>
<td>0.42</td>
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<tr>
<td>Nighttime</td>
<td>0.32</td>
<td>0.35</td>
</tr>
<tr>
<td>Daytime (1999)</td>
<td>0.25</td>
<td>0.39</td>
</tr>
<tr>
<td>Nighttime (1999)</td>
<td>0.08</td>
<td>0.35</td>
</tr>
</tbody>
</table>
MODIS SST – Pathfinder SST
daytime bias
MODIS SST – Pathfinder SST

nighttime bias