SCATSAT NRT data and Preliminary Calibration

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SCATSAT observations of cyclone TRAMI

ScatSat-1 at 30-Sep-2018 00:44 UTC

ScatSat-1 data are courtesy of ISRO. Image processed at JPL

ScatSat-1 Wind Speed [knots]
Initial SCATSAT Calibration using QuikSCAT

- Using QuikSCAT we determined calibration estimates from both Ocean and Amazon (from 1.1.3 testdata)
  - We correct for LOTD between QuikSCAT and SCATSAT using data derived from RapidSCAT.
  - They are not in agreement, neither were they for OSCAT, and to a lesser degree RapidScat.

<table>
<thead>
<tr>
<th></th>
<th>Ocean via QS</th>
<th>Amazon via QS</th>
<th>Difference</th>
<th>Used in proc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCATSAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HH adj.</td>
<td>+0.31 dB</td>
<td>-0.15 dB</td>
<td>+0.46 dB</td>
<td>+0.51 dB</td>
</tr>
<tr>
<td>VV adj.</td>
<td>-0.56 dB</td>
<td>-0.82 dB</td>
<td>+0.26 dB</td>
<td>-0.26 dB</td>
</tr>
<tr>
<td>RS (low SNR 2)</td>
<td></td>
<td></td>
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<tr>
<td>HH adj.</td>
<td>+0.07 dB</td>
<td>+0.25 dB</td>
<td>-0.18 dB</td>
<td>+0.16 dB</td>
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<tr>
<td>VV adj.</td>
<td>+0.17 dB</td>
<td>+0.28 dB</td>
<td>-0.11 dB</td>
<td>+0.23 dB</td>
</tr>
<tr>
<td>OSCAT</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>HH adj.</td>
<td>+0.53 dB</td>
<td>+0.15 dB</td>
<td>+0.38 dB</td>
<td>+0.53 dB</td>
</tr>
<tr>
<td>VV adj.</td>
<td>+0.30 dB</td>
<td>-0.06 dB</td>
<td>+0.36 dB</td>
<td>+0.30 dB</td>
</tr>
</tbody>
</table>
Updated Calibration Estimates

- Using 2018 QuikSCAT and 1.1.3 SCATSAT data
  - QuikSCAT at correct incidence angles to match SCATSAT.
  - Ocean: HH: +0.24 dB; VV: -0.56 dB
  - Land: HH +0.01 dB; VV: -0.68 dB (+0.15 / -0.54 without LTOD correction)
SCATSAT Calibration Stability over Amazon

SCATSAT and QuikSCAT gamma0 HH [dB]

SCATSAT and QuikSCAT gamma0 VV [dB]
Calibration Stability over Ocean

- **QuikSCAT was turned off at end of August 2018.**
- Only have contiguous SCATSAT 1.1.3 data since March 2018.
- We plan to use ASCAT-A/B collocations to track the calibration stability.
  - Triple-collocation of SCATSAT, ASCAT, + (NWP, buoy, etc), many options.

So far: seems stable to ~ 0.1 m/s (~0.1 dB)
NRT Data validation

Clearly meets QuikSCAT science reqs: 2 m/s (<20 m/s), 10% (>20 m/s) and 20 deg (RMS)
NRT Data validation

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NRT Data validation vs Buoys

Overall Speed Bias: 0.16; STD: 1.07

Overall Direction STD: 21.78
NRT Data validation and latency

Speed Bias [m/s]

Speed RMS [m/s]

Direction RMS [deg]

Direction bias to ECMWF

CDF of NRT L2B Latency

Meet operational req. of < 3 hours (median latency 90 min / nearly 90% at 3 hours)

vs ECMWF

ECMWF speed in [3, 30]
Preliminary C/Ku Winds

**Figure 4**

- **Speed Bias [m/s]**
  - Ku-only: Red line
  - Ku/C: Black line
  - C-only: Blue line

- **Speed RMS [m/s]**
  - Ku-only: Red line
  - Ku/C: Black line
  - C-only: Blue line

- **Direction RMS [deg]**
  - Ku-only: Red line
  - Ku/C: Black line
  - C-only: Blue line

- **Direction bias to ECMWF**
  - Ku-only: Red line
  - Ku/C: Black line
  - C-only: Blue line

- **Cross-Track Index**
  - 19 38 57 76 95 114133152

- **Direction Bias to ECMWF**
  - 19 38 57 76 95 114133152
Ring Artifacts

• Some revs have entire scans where data does not seem right.

• Only see issues on ground, not in scan angle / orbit angle space => geolocation error.
  • $\sigma_0$ seems to be right.
  • Gives large wind speed errors.
Summary / Future Work

• NRT data has been distributed since June 2018.
  • Consistently processed since March 2018.
  • Meets QuikSCAT science requirements (2 m/s; 20 deg).
  • Has median latency ~90 minutes from sensing time to data availability.

• Final 1.1.3 cross-calibration with QuikSCAT is essentially unchanged.

• Preliminary C/Ku data product generated for testing.

• Future Work:
  • Climate-quality SCATSAT version 1.0 (early FY20):
    • Implement KuSST GMF used for QuikSCAT and RapidScat.
    • Tweak beam balance.
    • Cross-track adjustment.
    • Stiles et al new neural-net rain correction based on ASCAT.
    • Released via PODAAC.
  • Release initial version of joint C-Ku data processing (mid/late FY20).
    • Address ASCAT calibration.

• NRT data available at sftp://rscatftp.jpl.nasa.gov; E-mail fore@jpl.nasa.gov for access.