Overview

- Review of NOAA GCOM-W Precipitation EDR
  - GPROF2010V2
- Areas for Improvement
  - Precipitation detection over the Western US
  - SST Product Dependence
- Evaluation of GPROF2017
### Program Requirements

#### JPSS Requirements - GCOM Precipitation Type/Rate

<table>
<thead>
<tr>
<th>EDR Attribute</th>
<th>Threshold</th>
<th>AMSR2 EDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable conditions</td>
<td></td>
<td>Delivered under &quot;all weather&quot; conditions</td>
</tr>
<tr>
<td>Horizontal cell size</td>
<td>5 km land (89 GHz FOV); 10 km ocean (37 GHz FOV size); 5-10 km sampling</td>
<td>5.0 km (land); 10 km (ocean)</td>
</tr>
<tr>
<td>Mapping uncertainty, 3 sigma</td>
<td>&lt; 5 km</td>
<td>~2.5 km</td>
</tr>
<tr>
<td>Measurement range</td>
<td>0 – 50 mm/hr</td>
<td>0 – 75 mm/hr</td>
</tr>
<tr>
<td>Measurement precision</td>
<td>0.05 mm/hr</td>
<td>0.01 mm/hr</td>
</tr>
<tr>
<td>Measurement uncertainty</td>
<td>2 mm/hr over ocean; 5 mm/hr over land</td>
<td>1.3 mm/hr (ocean); 3.6 mm/hr (land)</td>
</tr>
<tr>
<td>Refresh</td>
<td>At least 90% coverage of the globe about every 20 hours (monthly average)</td>
<td>91% every 20 h</td>
</tr>
<tr>
<td>Precipitation type</td>
<td>Stratiform or convective</td>
<td>Convective rain rate</td>
</tr>
<tr>
<td>Latency</td>
<td>25 minutes</td>
<td>8 min</td>
</tr>
</tbody>
</table>
Validation

GCOM-W/AMSR2 vs. MRMS Rain Rates

AMS2 - July 2015

GPCP - July 2015
Routine Monitoring

Reference Statistics

- RMSD: 0.94 mm/hr
- r: 0.30
- POD: 52.7%
- FAR: 23.7%

http://cics.umd.edu/pmeyers/amr2/
Applications

- bRR (Blended Rain Rate; below)
- eTRaP [Ensemble Tropical Rainfall Potential]
- Direct Broadcast
Detection Limitations

- False detection of precipitation based on Scattering Index and Tb thresholds
- Apply Turk (2016) cloud-free detection algorithm
- Use last IMS snow analysis for screening
Nighttime False Alarms
Linear Discriminant Analysis for Cloud-Free Scenes
FAR Reduction

<table>
<thead>
<tr>
<th></th>
<th>POD</th>
<th>FAR</th>
<th>CSI</th>
<th>HSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>0.644735</td>
<td>0.535026</td>
<td>0.370140</td>
<td>0.515073</td>
</tr>
<tr>
<td>Filtered</td>
<td>0.593108</td>
<td>0.318920</td>
<td>0.464190</td>
<td>0.618437</td>
</tr>
</tbody>
</table>
SST Product Reliability

- Currently using non-operational Reynolds $\frac{1}{4}^\circ$ OISST
- JPSS-RR suggests evaluating CMC SST
SST Product Sensitivity

- Would require validation with respect to requirements
- May require recalculation of a priori database
Evaluation of GPROF2017

- Collaboration with NASA/GPM
- Fully Bayesian retrieval
  - Separated by surface type, TPW, and near surface temp
- Trained with Dual-frequency Precipitation Radar
GPROF2010v3

GCOM-W/AMSR2 vs. MRMS Rain Rates

GPROF2010 Rain Rate (mm/hr)

MRMS Rain Rate (mm/hr)

POD

FAR
GPROF2017

GCOM-W/AMSR2 vs. MRMS Rain Rates

POD

FAR
Notes on GPROF2017

- Ongoing work to improve Conv/Strat using environmental conditions [Veljko Petkovic]
- Need to evaluate ancillary products for potential transition into STAR operational framework

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>POD</th>
<th>FAR</th>
<th>CSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPROF2010V3</td>
<td>0.83</td>
<td>0.37</td>
<td>0.55</td>
</tr>
<tr>
<td>GPROF2017</td>
<td>0.86</td>
<td>0.10</td>
<td>0.78</td>
</tr>
</tbody>
</table>
Summary & Paths Forward

- Modifications of AMSR2 precipitation algorithm reduce false alarms and improve performance metrics
- Implementation and reprocessing of updated GPROF2010 algorithm
- Suitability testing of GPROF2017 for NOAA operations
- Leveraging more ancillary data
  - GOES-16 ABI & GLM
  - Environmental information