Cal/Val Tasks Status

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Task #16 Geolocation Verification
Task #23 Raob Validation
Task 16: Geolocation Verification

OBJECTIVE:
Evaluate pointing tolerance of the ATMS FOVs

DESCRIPTION:
- Tools
  - SDL tool to plot geolocated data (GeoBrowser)
  - SDL tool to determine coastline points and compare to coast truth (GeoLocate)
- Cal/Val Phase(s): Sensor Checkout, ICV, LTM
- Sensor mode: normal mode SDRs

Results:
- 5.2° (channels 1,2) pointing tolerance validated to .3°
- 2.2° (channels 3-16) pointing tolerance validated to .2°
- 1.1° (channels 17-22) pointing tolerance validated to .1°
Geolocation Verification Method

- Pick multiple regions with high coastline contrast and orbits with coastal crossings close to nadir (BP 24-74)

- Calculate the inflection point between every four consecutive points in across-track rows and along-track columns

- Compare points to actual coast (GSHHS fine resolution dataset)

- For each approximate coastline point the intersection of the perpendicular is found on the actual coast. This distance is separated into a North-South and East-West error

- Accumulate error statistics for Channels 1,3,16 & 17
4 Regions

Baja Peninsula
10 Data Sets
10500 Crossing Pts.

US East Coast
12 Data Sets
7500 Crossing Pts.
4 Regions

South America West Coast
12 Data sets
4500 Crossing Pts.

Red Sea
9 Data sets
5800 Crossing Pts.
Red Sea
Example Data Set

Orbit 668
14 Dec 11
7 Granules
271 Crossing Pts. (Channel 1)
Channels 1, 3
Mean Errors
Specification Channel 1: ±0.3°; Channel 3: ±0.2°
**Channels 16, 17**

**Mean Errors**

Specification: Channel 16 ± .2° ; Channel 17 ± .1°

<table>
<thead>
<tr>
<th>Channel 16</th>
<th>Channel 17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In-Track Mean</strong></td>
<td><strong>In-Track Mean</strong></td>
</tr>
<tr>
<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
</tr>
<tr>
<td><strong>Cross-Track Mean</strong></td>
<td><strong>Cross-Track Mean</strong></td>
</tr>
<tr>
<td><img src="image3" alt="Graph" /></td>
<td><img src="image4" alt="Graph" /></td>
</tr>
</tbody>
</table>
Summary

12 days of data
4 geographic regions
40+ data sets per channel
100 – 300 crossing pts. each data set
28K total crossing points
Slight mean bias on some channels
Bias well below OPSCON limits
Spacecraft maneuver Geolocation
COLA – 31 Jan  OMPS Limb Pitch – 13 Feb

Channel 1
In-Track Mean

Channel 1
Cross-Track Mean

Channel 3
In-Track Mean

Channel 3
Cross-Track Mean
Summary

30 continuous days of Geolocation error analysis

Overlapping 2 Spacecraft maneuver events

No shift in mean error detected
Edge of Scan Geolocation Error Analysis

Use BPs 1-10, 86-96

5 Geographic Regions

30 Data sets

16K Total crossing pts.
Edge of Scan Results
Channels 1, 3
Specification: Channel 1 ± .3°; Channel 3 ± .2°
Edge of Scan Error Results
Channels 16, 17
Specification: Channel 16 $\pm 0.2^\circ$; Channel 17 $\pm 0.1^\circ$
Error analysis using first and last 10 beam positions

Approximately 16K data points

Some slight biases detected

Biases well within the OPSCON limits

Results consistent with previous error analyses
Common Code Geolocation Tool Set

**Goal:** Produce a stand alone Geolocation error analysis tool for use by NOAA STAR during LTM.

Investigate the Land/Sea fraction method of Geolocation error analysis. ("Bennartz, ‘98")

Define mean & standard deviation of brightness temperatures as a function of Land/Sea fraction for a large data set.

Generate a theoretical data set of mean & std deviation for a number of navigation errors.

Compare theoretical curves to actual curves to define the error.

Integrate the Land/Sea fraction method into our existing tool set and compare.

Utilize data sets from heritage sensors in comparisons

Generate standalone tool kit for NOAA STAR use and provide annual support and updates
OBJECTIVE:
Validate ATMS radiance calibration through independent observations

DESCRIPTION:

- Tools
  - SDL - GeoBrowser Toolkit
  - NPROVS – Profile Display
  - NOAA STAR – CRTM
- Cal/Val Phase(s): ICV, LTM
- Sensor mode: normal mode SDR

Results:
Database of coincident radiosonde and ATMS observations.
Comparison of observed and calibrated response (radiance and brightness temperature).
Method

Generate a database of coincident Raobs and ATMS observations.

“Good” Matchup

90 min or less time differential

Less than 50% cloud cover

Over water trajectory

Use sounding data as input to the CRTM

Compare calculated radiances with observed
## Matchup Summary

Contains Raob matchup dates, release times, overpass times, orbit numbers, etc. organized by location.

<table>
<thead>
<tr>
<th>Location</th>
<th>Station ID</th>
<th>Lat, Lon</th>
<th>OZ Release</th>
<th>Overpass T</th>
<th>Delta Time</th>
<th>12Z Release</th>
<th>Overpass T</th>
<th>Delta Time</th>
<th>Matchups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hilo</td>
<td>91285</td>
<td>19.72 N, 155.07W</td>
<td>23:00</td>
<td>23:30</td>
<td>31min</td>
<td>11:00</td>
<td>11:45</td>
<td>47min</td>
<td>45</td>
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<tr>
<td>Lihue</td>
<td>91165</td>
<td>21.98 N, 159.35 W</td>
<td>23:00</td>
<td>23:30</td>
<td>35min</td>
<td>11:00</td>
<td>11:45</td>
<td>52min</td>
<td>71</td>
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<tr>
<td>Athalassa</td>
<td>17607</td>
<td>35.15N 33.40E</td>
<td>None</td>
<td>0:45</td>
<td>N/A</td>
<td>11:00</td>
<td>11:30</td>
<td>29min</td>
<td>41</td>
</tr>
<tr>
<td>Casale Brindisi</td>
<td>16320</td>
<td>40.65N 17.95E</td>
<td>23:00</td>
<td>0:45</td>
<td>81min</td>
<td>11:00</td>
<td>11:34</td>
<td>34min</td>
<td>54</td>
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<tr>
<td>Lerwick</td>
<td>3005</td>
<td>60.13N 1.18W</td>
<td>23:15</td>
<td>1:25</td>
<td>2hrs 30min</td>
<td>11:15</td>
<td>11:40</td>
<td>41min</td>
<td>22</td>
</tr>
<tr>
<td>Cagliari</td>
<td>16560</td>
<td>39.25N 9.05E</td>
<td>22:45</td>
<td>1:00</td>
<td>2Hrs 15min</td>
<td>10:50</td>
<td>12:00</td>
<td>70min</td>
<td>16</td>
</tr>
<tr>
<td>Kuwait Int</td>
<td>40582</td>
<td>29.22N 47.98E</td>
<td>23:30</td>
<td>22:30</td>
<td>60min</td>
<td>11:30</td>
<td>10:20</td>
<td>70min</td>
<td>49</td>
</tr>
<tr>
<td>King Fahd</td>
<td>40417</td>
<td>26.45N 49.82E</td>
<td>23:00</td>
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<td>45min</td>
<td>11:05</td>
<td>10:00</td>
<td>65min</td>
<td>46</td>
</tr>
</tbody>
</table>

**Total** 344
Data files are organized by release location then date.

Example:
- Athalassa
- Feb
- 9Feb1108

Included Files:
- .txt
- .png
- .mat

Example:
- 9Feb1108.txt
- 9Feb1108.png
- 9Feb1108.mat

day month release time
NPROVS Profile Display

Used for matchup identification and sounding data .txt file generation
Example
9Feb1108

Athalassa Release Site

Radiosonde Trajectory
9Feb1108.mat
(48 Levels)

WMO Station ID
Matchup date and time
Observed radiosonde Parameters
Radiosonde position
ATMS pointing, scan #, FOV
Land fractions for each FOV (3 Bands)
SDR brightness temps (22 Channels)

.mat file contains complete matchup data
Compare Calculated to Observed

Use Raob pressure, Temperature, and water vapor profiles as inputs to the CRTM Atm. structure

Compare the calculated radiance to the observed values to assess SDR calibration accuracy

Trend statistics for a significant data set
Questions