NPP Advanced Technology Microwave Sounder (ATMS):
Sensor Description and Preliminary Data Product Performance

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Abstract
A suite of sensors scheduled to fly onboard the NPOESS Preparatory Project (NPP) satellite in 2011 will continue the development of environmental data records by operational and research missions over the last 40 years. The Cross-track Infrared and Microwave Sounding Suite (CrIMSS), consisting of the Cross-track Infrared Sounder (CrIS) and the first space-based, Nyquist-sampled cross-track microwave sounder, the Advanced Technology Microwave Sounder (ATMS), will provide vertical atmospheric profile information needed to improve numerical weather and climate modeling. The ability of ATMS to sense temperature and moisture profile information in the presence of non-precipitating clouds complements the high vertical resolution of CrIS. Furthermore, the ability of ATMS to sense scattering of cold, warm background radiances from the tops of precipitating clouds allows the retrieval of precipitation intensities with useful accuracies over most surface conditions.

This poster will present several assessments of the performance of ATMS and the geophysical quantities that are to be derived using ATMS measurements. Prelaunch testing of ATMS has characterized the principal calibration performance and has enabled predictions of on-orbit performance with high levels of confidence. Planned on-orbit characterization of ATMS will further improve both the measurement quality and the understanding of various error contributions.

ATMS Continues Successful AMSU/MHS/HSB Heritage

ATMS Overview
• Built by Northrop Grumman Electronic System under contract to NASA Goddard
• NPP unit delivered Nov. 2009 for 2011 launch; C1 unit on track for 2012 delivery
• Total-power radiometer with 22 channels; based on AMSU/MHS/HSB heritage

ATMS Radiometer Block Diagram

ATMS Design Features and Challenges
• Antenna quasi-octicaly yield a compact system through frequency diplexing
• Highly integrated scan drive and electronics subsystems
• High-performance MMIC receivers

Summary of ATMS Radiometric Performance
• The ATMS SDR products will meet or exceed the accuracy of the equivalent AMSU/MHS products
• Nyquist sampling of ATMS TDR products allows improved EDR products due to beam sharpening
• Prelaunch radiometric testing has indicated excellent ATMS performance
• Planned on-orbit calival activities will further refine calibration accuracy and ensure improved "climate quality"

ATMS Products (CDR and IP not archived by IDPS)

Summary of Key ATMS Attributes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PFM Measurement</th>
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<tbody>
<tr>
<td>Envelope dimensions</td>
<td>70x69 x 40 cm</td>
</tr>
<tr>
<td>Mass</td>
<td>75 kg</td>
</tr>
<tr>
<td>Operational average power</td>
<td>1199 W</td>
</tr>
<tr>
<td>Operational peak power</td>
<td>200 W</td>
</tr>
<tr>
<td>Data rate</td>
<td>30 kbps</td>
</tr>
<tr>
<td>Absolute calibration accuracy</td>
<td>0.6 K</td>
</tr>
<tr>
<td>Maximum nonlinearity</td>
<td>0.36 K</td>
</tr>
<tr>
<td>Frequency stability</td>
<td>0.5 MHz</td>
</tr>
<tr>
<td>Pointing knowledge</td>
<td>0.03 degrees</td>
</tr>
<tr>
<td>Orbit altitude</td>
<td>530.51302 K</td>
</tr>
<tr>
<td>Reliability</td>
<td>0.87</td>
</tr>
</tbody>
</table>

RMS Boundary Layer Temperature Error (K)

RMS Boundary Layer Moisture Error (%)

Accumulated forecast error reduction due to various observing instruments for the February 2007 forecasts – ¼ degree system

Retrieval of Precipitation Using Opague Microwave Bands

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Acknowledgments
Sergey Krinichnsky and Robert Lambek (NASA GSFC) provided expert guidance to all facets of ATMS development. Francisco Andolz (GSFC) provided assistance with ATMS data formatting and calibration of land data. Joseph Hyer (NOAA) contributed substantially to ATMS test data analysis and planning of calival activities. The NGE team including Hector Malcas, Steve Opej, Douglas MacNeil, Praboud Patel, Kent Anderson, Dennis Lord, Louis Anderson, and Lvidrl. (name) patiently answered many questions and provided insight into countless tests, procedures, and analyses. The NGAS team including Giovanni DeAmiti, Paul Lee, Ronson Chua, and Depu Ge assisted with calibration and details related to SDR and EDR production. Karen St. Germain, Bruce Guenther, Carl Hoffman, and Clint Northrop at the NPOESS Integrated Program Office supported and facilitated this work. The authors gratefully acknowledge many who have made significant and profound contributions to the development and calibration of ATMS, including John Solman, David Staelin, Phil Rosenkranz, Bjorn Lambrichtzen, Jim Shiuu, Lloyd Chodester, Gene Pae, and Tae Mo. The authors apologize for any omissions and look forward to future collaborations.

This work was sponsored by the National Oceanic and Atmospheric Administration under Air Force contract FA8721-05-C-0002. Opinions, interpretations, conclusions, and recommendations are those of the authors and not necessarily endorsed by the United States Government.