Recent Activities with AIRS Level-2 Profile Data at the SPoRT Center

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Spring 2013 AIRS Science Team Meeting
21 May 2013
Outline

• SPoRT Paradigm/Overview
• Situational Awareness Activities
• Data Assimilation Activities
SPoRT Mission and Paradigm

- Apply satellite measurement systems and unique Earth science research to improve the accuracy of short-term weather prediction at the regional and local scale
- Bridge the “Valley of Death”
- Can’t just “throw data over the fence”
  - Maintain interactive partnerships with help of specific advocates or “satellite champions”
  - Integrate into user decision support tools
  - Create forecaster training on product utility
  - Perform targeted product assessments with close collaborating partners
- Concept has been used to successfully transition a variety of satellite datasets to operational users for nearly 10 years
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AIRS helps determine stratospheric ozone intrusions associated with mid-latitude and extratropical cyclone strengthening and damaging non-convective winds

- Enhances interpretation of RGB products
- Full transition of product to Weather Predication Center (WPC) and Ocean Prediction Center (OPC) in N-AWIPS decision support system
- Numerous posts on SPoRT and NOAA Proving Ground blogs related to product
- Journal of Operational Meteorology paper on use at WPC/OPC
CIRA/SPoRT* developing layer precipitable water (LPW) product that uses vertical information from AIRS; enhances the utility of popular total PW product used operationally by WFOs.

* Product development by John Forsythe and Stan Kidder (CIRA); operational assessment by SPoRT; funded by SPoRT.
AIRS profiles for convective initiation

- SPoRT is actively working to engage NWS forecasters in the use of soundings from AIRS, IASI, and CrIS for situational awareness of CI
- Mid-level moisture and above PBL lapse rates may be valuable for gaining confidence in regional models where other verifying observations are not available
- Currently developing training to communicate strengths and limitations of hyperspectral IR sounder profiles
- Plan to come up with a strategy for ingesting into AWIPS II
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AIRS-Enhanced 3D Moisture Analysis

- Only TPW satellite observations available over Pacific to track moisture features; models provide some additional guidance
- AIRS T and q add detail around clouds resulting in more favorable moisture analysis over Pacific than real-time GFS analysis

Correlation ($r^2$) with CIRA TPW

<table>
<thead>
<tr>
<th></th>
<th>AIRS v6</th>
<th>AIRS MIT</th>
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<tr>
<td>24-hour</td>
<td>0.679</td>
<td>0.704</td>
</tr>
<tr>
<td>48-hour</td>
<td>0.672</td>
<td>0.741</td>
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- Current work is focusing on bias correction techniques for the assimilation of the profile data
- Working with the Hydrometerological Testbed (HMT) to evaluate impact of AIRS on atmospheric river analyses/forecasts
Improving Mid-Latitude Cyclone and “Sting Jet” Forecasts

- Ongoing research includes the assimilation of AIRS T and q profiles into the WRF model to address non-convective wind events called “sting jets”
- Will addition of profiles improve the model representation of T and q and better resolve warm, dry stratospheric air intrusions?
- If stratospheric intrusions are better resolved, will model representation of sting jets improve?
- Additional applications using CrIS soundings
L2 cloud info for L1B assimilation*

- Can we use cloud information (such as cloud top pressure) obtained from the L2 profiles to better characterize which L1B channels are assimilated?
- Comparison of CTP defined within GSI (which determines which radiances are deemed cloud-free) can at times miss some cloud features
- In these regions, assimilation of profiles has shown larger analysis and forecast impact

*T (K) ID at σ=39 (≈500 hPa) for 0000 UTC analysis 22 November 2011
GSI CTP for 0000 UTC analysis on 22 November 2011
MODIS CTP valid 2240 UTC on 22 November 2011

*This work funded through the JCSDA
Summary

- SPoRT is a proven community leader for transitioning satellite products to operational end users and is working hard to bring data from AIRS to forecasters.
- SPoRT products using AIRS data are currently or will soon be evaluated at WFOs and National Centers:
  - Ozone profiles: HPC/WPC
  - Moisture profiles (as part of CIRA LPW): Western Region WFOs
  - Temperature and moisture profiles: Eastern Region WFOs
- SPoRT also assimilates AIRS into regional models to address specific forecast issues:
  - Atmospheric rivers
  - Mid-latitude cyclones/sting jets
- We continue to develop similar capabilities with IASI and CrIS profiles as well.

Please contact me if you have an idea for an AIRS-related product that might benefit operational forecasters.

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