Transition of AIRS Products to the National Weather Service

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Outline

• SPoRT Paradigm/Overview
• Operational Transition Activities
• Testbed Transition Activities
• Initial V5 vs V6 Comparisons
**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**
**AIRS T and q profiles in HRRRAK**

- Collaboration between MSFC/SPoRT and the Alaska Region Supercomputing Center (ARSC) partially funded by Alaska Space Grant Program
- Using Gridpoint Statistical Interpolation (GSI) to assimilate AIRS thermodynamic profiles into High-Resolution Rapid Refresh for Alaska (HRRRAK) employed by National Weather Service offices to improve short-term forecasts
- SPoRT has provided real-time QC’ed AIRS T and q profiles from LANCE in necessary format
- First real-time forecasts generated starting at the end of March 2012 (see image at right)
- Full transition of code to ARSC for processing AIRS profiles is scheduled for early summer 2012
- Will work with ARSC to implement V6 once online this summer

**Current Ops**

**Ops w/ AIRS**

**AIRS Analysis Increment**

850 hPa temperature analyses for sample day valid 30 March 2012 at 0000 UTC

Images from Don Morton and Kayla Harrison (ARSC/UAF)

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**AIRS Total Ozone at HPC/OPC**

- AIRS helps determine stratospheric ozone intrusions associated with mid-latitude and extratropical cyclone strengthening
- Enhances interpretation of RGB products
- Full transition of product to Hydrometeorlogical Predication Center (HPC) and Ocean Prediction Center (OPC) into N-AWIPS decision support system completed this week
- Working with forecasters from HPC/OPC to see if total ozone or some subset of the ozone profile is best for this application

Images from Michael Folmer (HPC/OPC) and Andrew Molthan (SPoRT)

**Suspected stratospheric dry air on windward side of mid-latitude cyclone**

**AIRS O₃ confirms stratospheric air intrusion**
AIRS CO with NWS WFOs

- NWS offices issue fire hazard and public health warnings
- Clouds and smoke can look the same in satellite imagery; visible imagery not available at night
- Enhances use of satellite imagery by using the CO as a proxy for smoke location
- CO can also be a tracer that moves out ahead of particulate matter that causes health concerns to indicate direction of atmospheric motion
- Currently working with Albuquerque and Great Falls to get this product into their WFOs

Images from Frank LaFontaine (SPoRT)

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AIRS T and q in SPoRT-WRF

- AIRS T and q profiles can aid in improving short-term forecasts of moisture and atmospheric stability important for regional convective forecasts.

- AIRS profiles were assimilated into a version of the SPoRT-WRF, which was evaluated last spring at the Hazardous Weather Testbed’s (HWT) Experimental Forecast Program.

- Forecasts from AIRS produced mixed results with many of the forecasts being cooler and drier than no-AIRS forecasts:
  - Possible cool/dry bias in V5 profiles
  - Non-cycling DA approach

- Will continue to demonstrate value of AIRS profiles to HWT in this year’s SPoRT-WRF
**Saharan Air Layer Detection from AIRS**

- Hurricane Research Division (HRD) has been interested in using AIRS to detect dry, dust-laden air that influences hurricane development in eastern Atlantic.
- Collaborative project with HRD and OPC to evaluate SAL detection.
- Very preliminary results indicate that AIRS may have some ability to detect SAL.
- Have had some problems using dust_flag and dust_score variables in L2 support products (see backup slide).

**RGB image from Michael Folmer (HPC/OPC)**

**RGB product detects broad area of dust but unable to quantify height or depth**
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.
- Evaluate integrated water vapor in specific layers and vapor fluxes.

Working with the Hydrometerological Testbed (HMT) to evaluate impact of AIRS on atmospheric river analyses/forecasts.

SPoRT plans to produce daily real-time layered moisture analyses using AIRS, IASI, and CrIS.

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Comparison of V5 vs V6 Data

- V6 provides increased retrieval yields that appear consistent with atmospheric patterns
- V6 eliminates some of the cool/dry bias that appears in V5

Images from Shih-Hung Chou and Jayanthi Srikishen (SPoRT)
Comparison of V5 vs V6 Forecasts

- Subtle differences between V5 and V6 TPW forecasts; AIRS produces more realistic-looking atmospheric river feature than CNTL
- AIRS improves precipitation forecasts at most precipitation times and most thresholds; however, at this time it is unclear whether V6 provides improved precipitation forecasts
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
  – T and q profiles: HWT, Alaska WFOs, HRD/OPC, HMT
  – Ozone profiles: HPC/OPC
  – Carbon Monoxide: Southern and Western Region WFOs

• SPoRT is actively evaluating differences between V5 and V6 profiles for selected cases and will continue to provide feedback to the AIRS team as V6 development efforts conclude
Backup Slides

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Backup Slides

Integrated Vapor Transport \((kgm^{-1}s^{-1})\) product for 12-hr forecast valid 10/14/2009 1200 UTC

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