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

*Images from Don Morton and Kayla Harrison (ARSC/UAF)*
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 $O_3$ 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
**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.

Images from Danielle Kozlowski (SPoRT Intern)

transitioning unique NASA data and research technologies to operations
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 product detects broad area of dust but unable to quantify height or depth

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

[Image of Total Precipitable Water valid at ~0000 UTC on 2009 October 14]

• 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
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
Backup Slides

Integrated Vapor Transport \((\text{kgm}^{-1}\text{s}^{-1})\) product for 12-hr forecast valid 10/14/2009 1200 UTC
	ransitioning unique NASA data and research technologies to operations