Applications using Satellite Sounder Products at the NASA SPoRT Center

Emily Berndt[1], Bradley Zavodsky[2], Gary Jedlovec[2], Clay Blankenship[3]

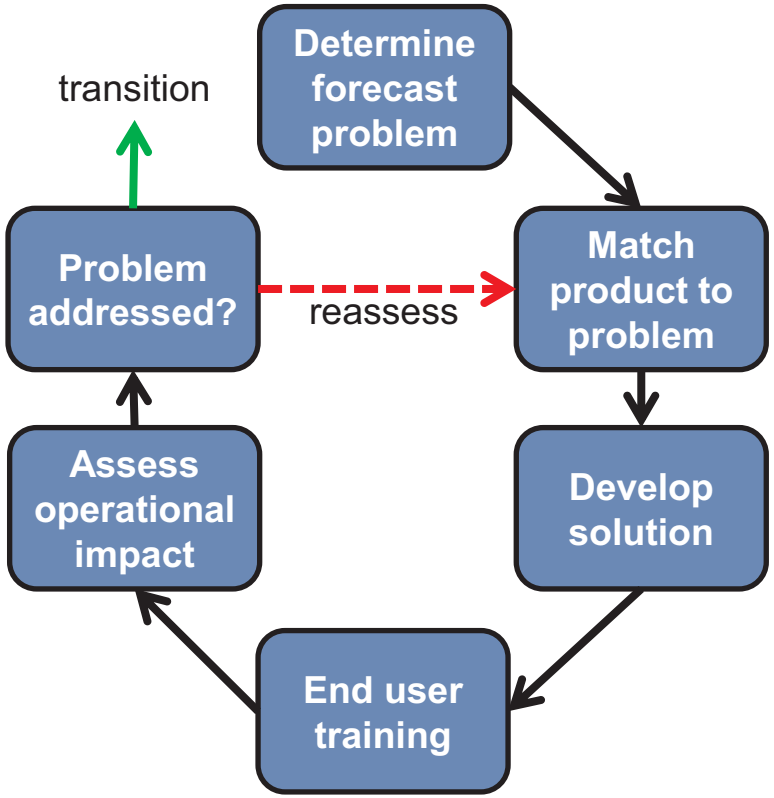
[1]NASA Postdoctoral Program Marshall Space Flight Center, Huntsville, Alabama
[2]Short-term Prediction Research and Transition Center NASA/MSFC, Huntsville, Alabama
[3]Universities Space Research Association, Huntsville, Alabama

STAR JPSS Annual Science Team Meeting
Soundings EDR Breakout Session 5d
14 May 2014

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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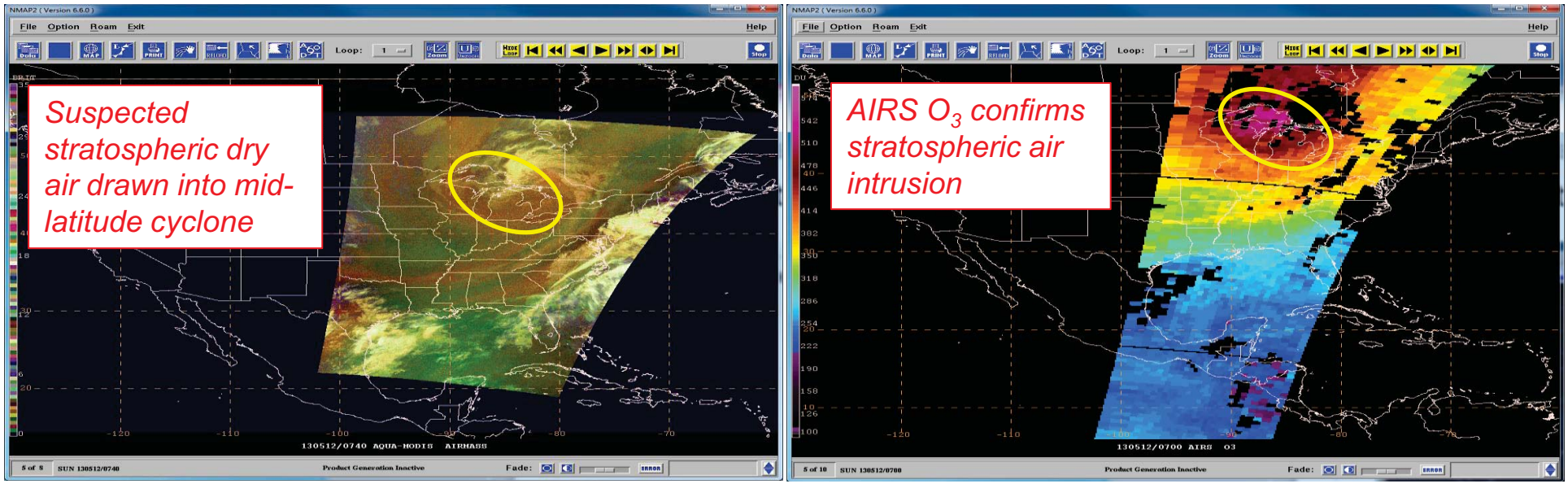
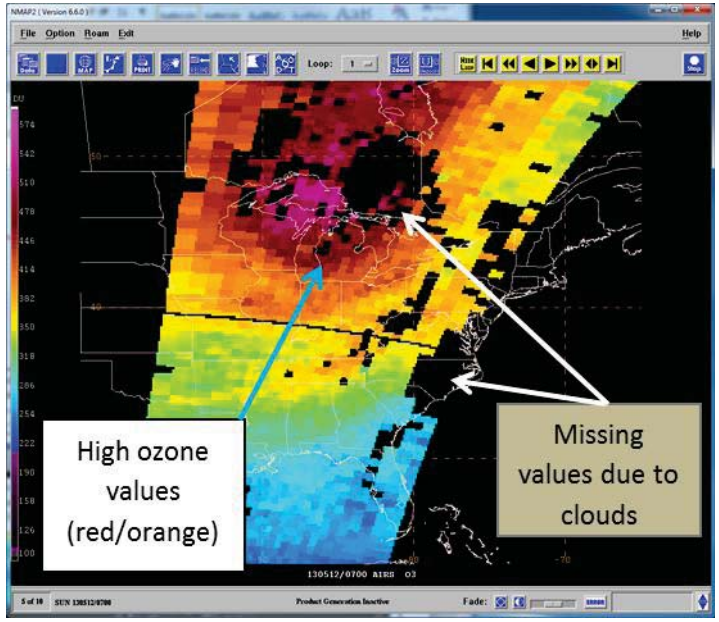
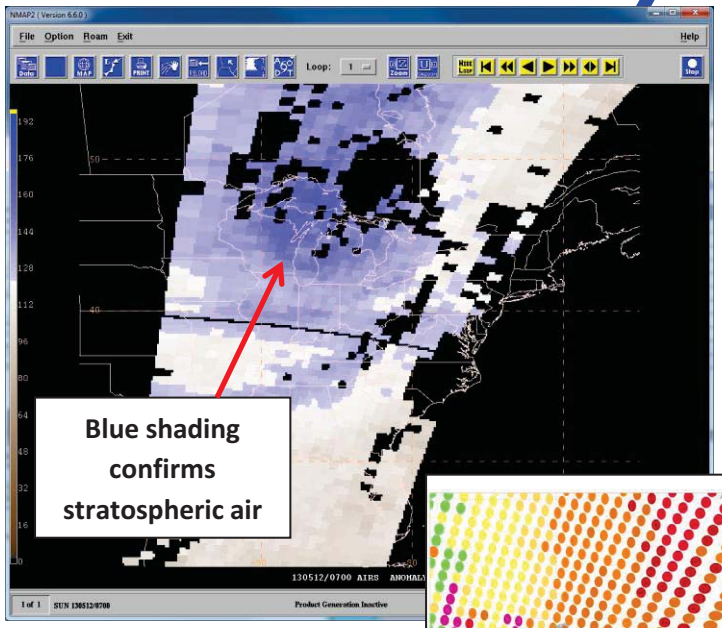
AIRS Total Ozone at WPC/OPC

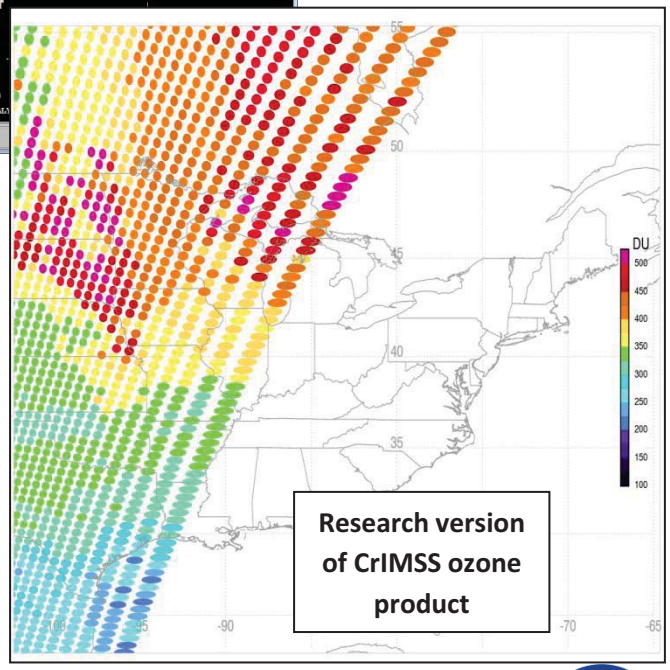


- AIRS helps determine stratospheric intrusions associated with mid-latitude and extratropical cyclone strengthening and damaging non-convective winds
- Enhances interpretation of RGB products
- Full transition of product to Weather Predication Center (WPC) and Ocean Prediction Center (OPC) in N-AWIPS 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

AIRS Total Ozone at WPC/OPC



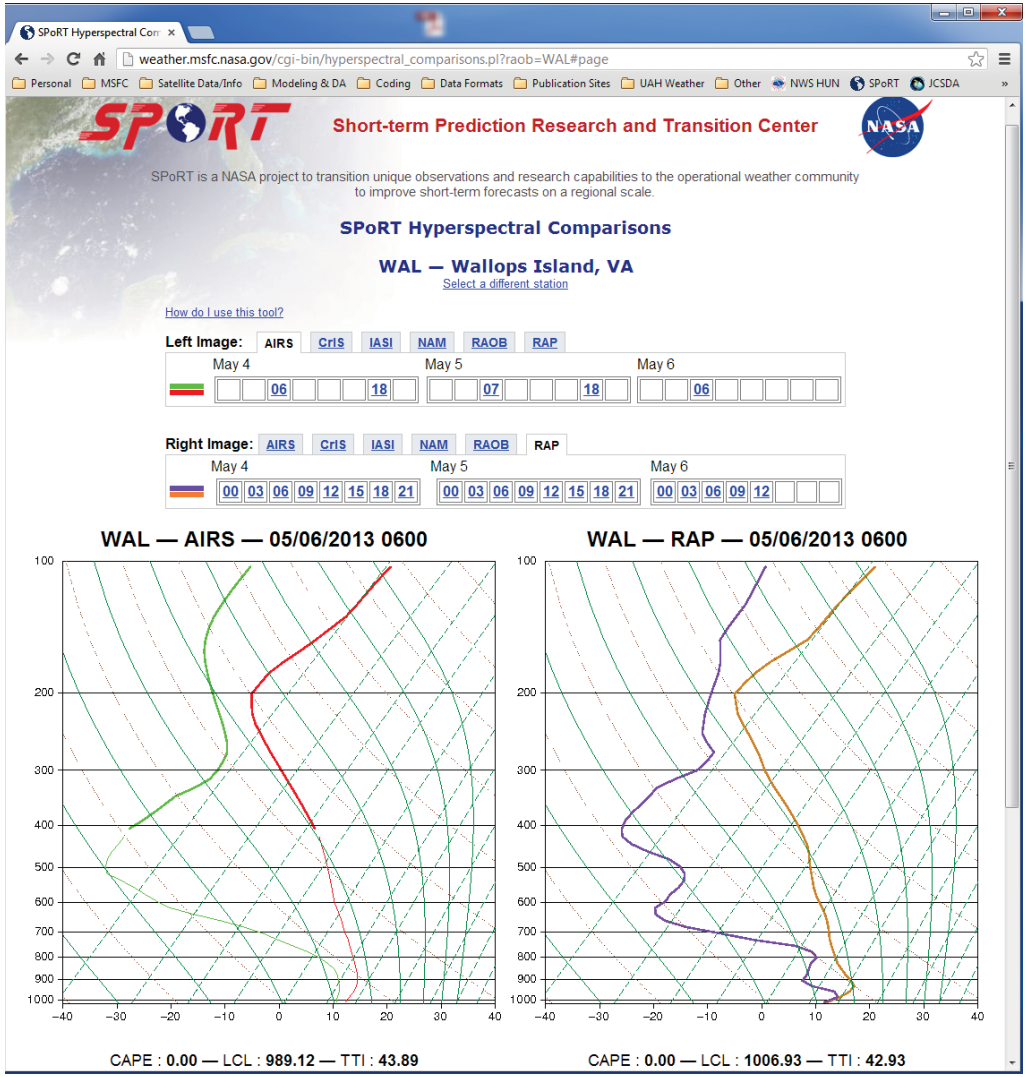




- Paper on development, application, and transition of SPoRT ozone products in draft for IEEE Transactions in Geoscience and Remote Sensing
- Anomaly product developed to confirm high ozone values are stratospheric and not just within the climatological range
- Similar CrIMSS product in development in anticipation of the release of NUCAPS

Profiles for convective initiation

- SPoRT is actively working to engage NWS forecasters in the use of soundings from AIRS 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
- Development of IASI and NUCAPS CrIS profiles will yield better comparison of AIRS, IASI, CrIS soundings and the potential for ~6 sondes per day locally



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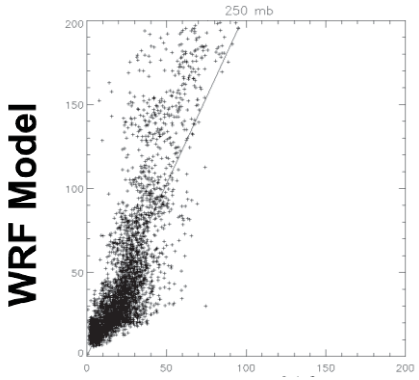
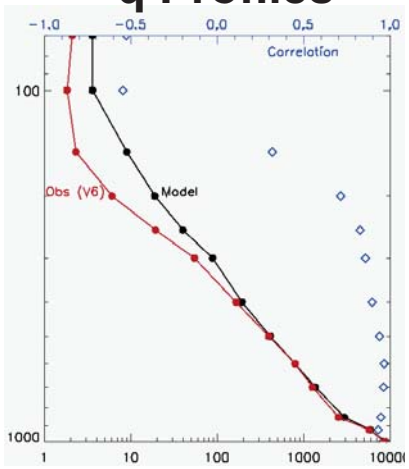
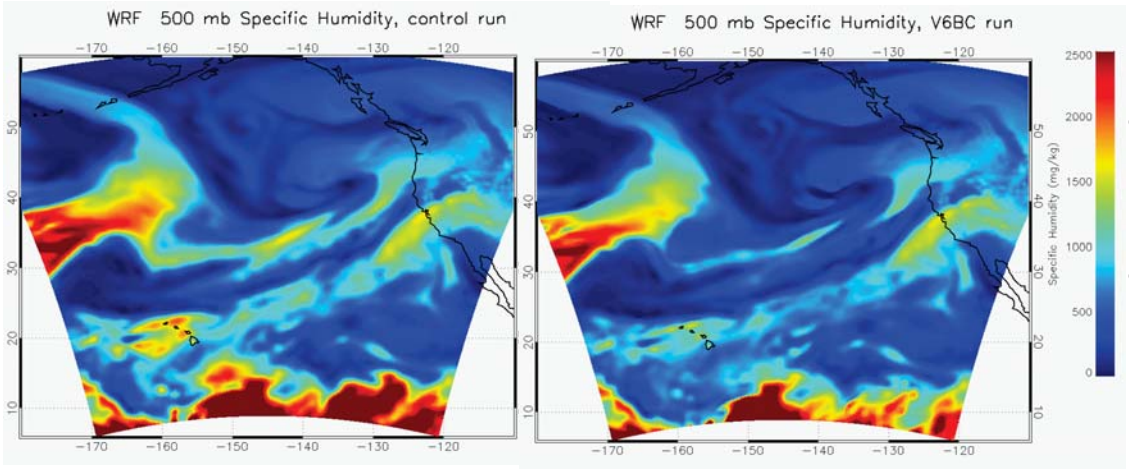
Assimilation of Bias-Corrected AIRS Profiles

250 mb Spec. Hum. [g/kg]



Mean Model/Obs q Profiles

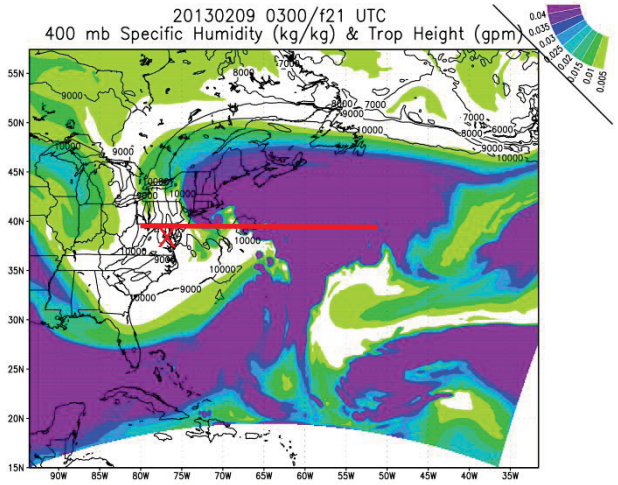




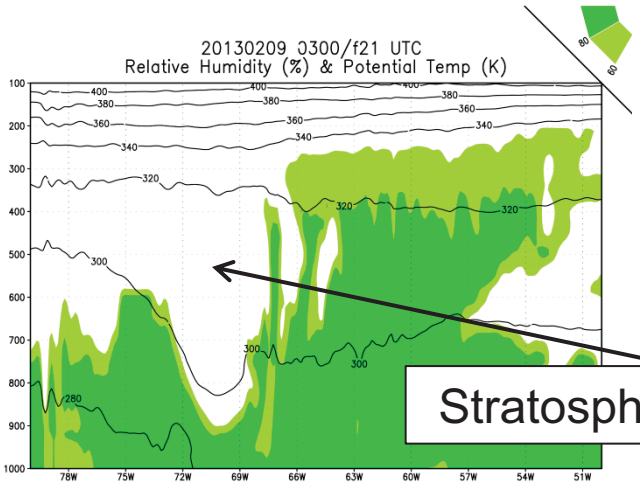
Goal: improve WRF forecasts by assimilating retrieved AIRS T/q profiles

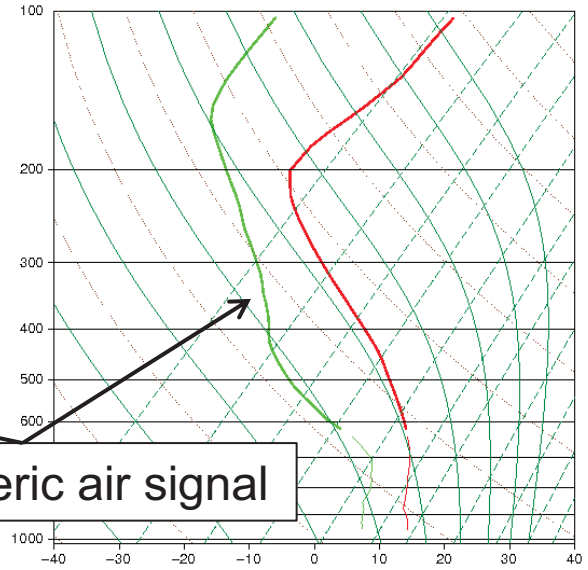
- In areas where radiance observations are rejected due to cloud contamination, we can use retrieved profiles above the cloud level
- One problem is the systematic humidity bias between model and observations in middle/upper troposphere (obs are drier).
- q bias is removed by a simple linear correction at each layer (T bias is near zero)
- Atmospheric river features are narrower after assimilating AIRS profiles
- Use of bias correction means this is not just a result of the observations drying the model everywhere (since mean innovation is now near zero)

Improving Mid-Latitude Cyclone and Non-Convective Wind Forecasts



- Ongoing research includes the assimilation of AIRS, IASI and CrIMSS T and q profiles into the WRF model to address stratospheric intrusions and non-convective wind events
- Will addition of profiles improve the model representation of T and q and better resolve warm, dry stratospheric air intrusions?



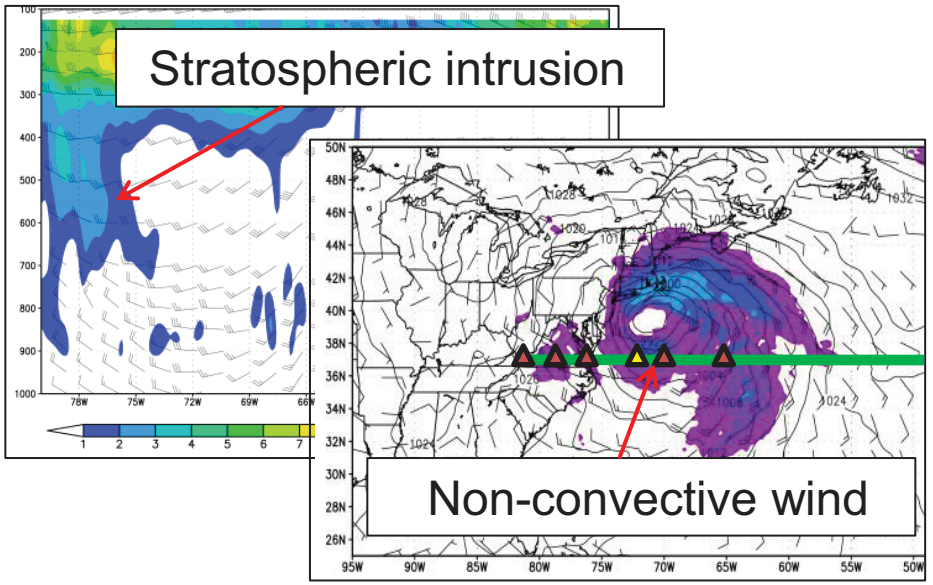


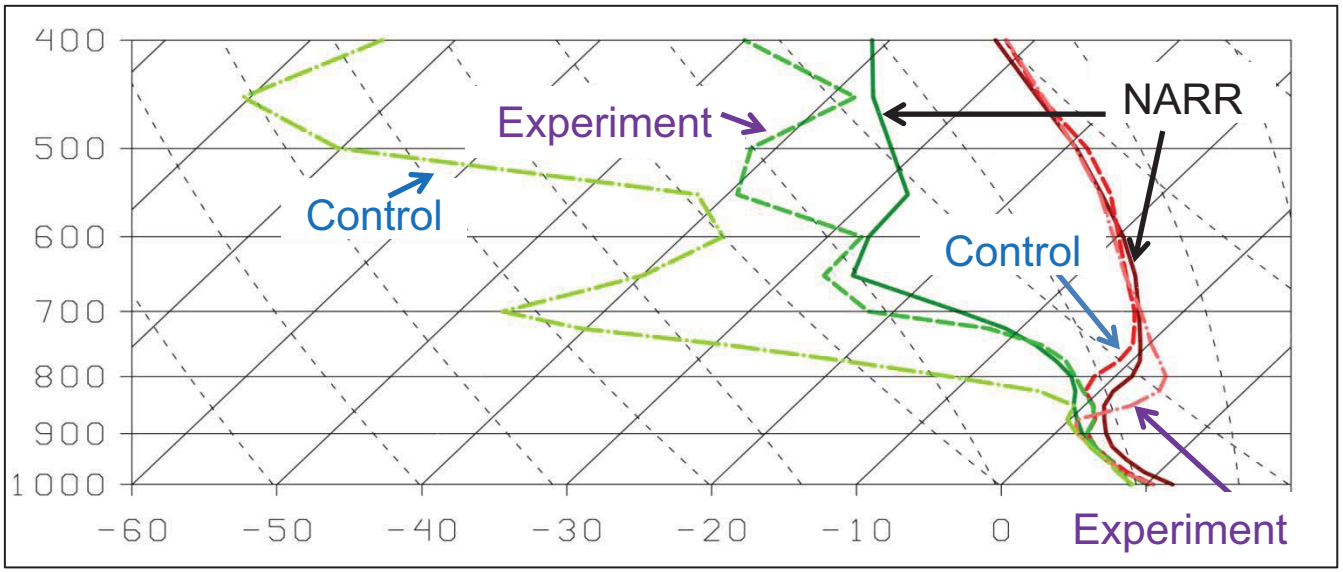
Stratospheric air signal

- If stratospheric intrusions are better resolved, will model representation of near-surface non-convective winds improve?

Improving Mid-Latitude Cyclone and Non-Convective Wind Forecasts

- Results show modeling low-level stability is more important than correctly modeling the stratospheric intrusion
- Modeling low-level stability could be improved by:
  - using NUCAPS CrIS instead of CrIMSS
  - developing a GSI Module to assimilate profiles with appropriate Error values





Modeling low-level inversion important for resulting wind forecast

Summary

- SPoRT is a proven community leader for transitioning satellite products to operational end users and is working to bring data from hyperspectral infrared sounders to forecasters
- SPoRT products using AIRS data are currently or will soon be evaluated at WFOs and National Centers
  - Ozone profiles
  - Sounder profiles for convective initiation
- SPoRT also assimilates AIRS, CrIMSS, and IASI into regional models to address specific forecast issues
  - Atmospheric rivers
  - Mid-latitude cyclones/non-convective winds
- We continue to develop similar capabilities with IASI and CrIS profiles as well, especially as NUCAPS becomes available

Please contact me if you have an idea for an AIRS, CrIS, or IASI -related product that might benefit operational forecasters

emily.b.berndt@nasa.gov

http://weather.msfc.nasa.gov/sport/ http://nasasport.wordpress.com/