AIRS and CAMEX

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AIRS Overview

> AIRS is a complete atmospheric sounding *system*
> It represents a quantum leap forward in monitoring of the atmosphere
> Weather forecast accuracy is expected to improve significantly

Components:
- **AIRS - IR T/q-sounder; 2378 channels (3.7 to 15.4 µm)**
- **AMSU - MW T-sounder; 15 channels (23 to 90 GHz)**
- **HSB - MW q-sounder; 4 channels (150-190 GHz)**

Spatial resolution:
- **AIRS & HSB: 15 km @ nadir**
- **AMSU: 40 km @ nadir**
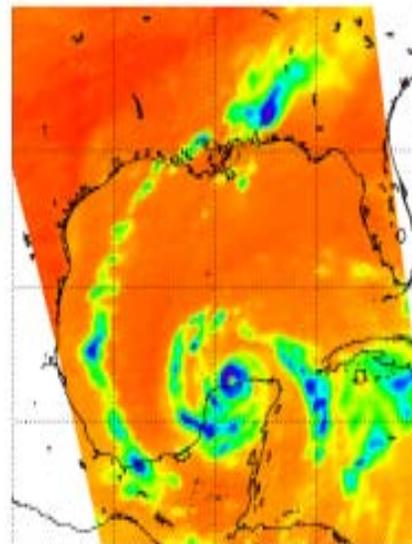- **Composite (retrievals): 40 km @ nadir**

Products:
- **T-profiles: 0-40 km (±1 k every 1 km in troposphere)**
- **q-profiles: 0-40 km (± 10% every 2 km in troposphere)**
- **Miscellaneous: SST; cloud top height; cloud fraction; precipitation; ozone**

Hurricane Monitoring with AIRS

Isidore, Category 3-4 over Yucatan, 9/22/02
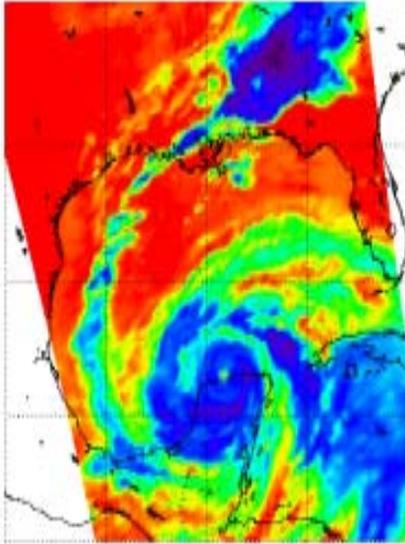
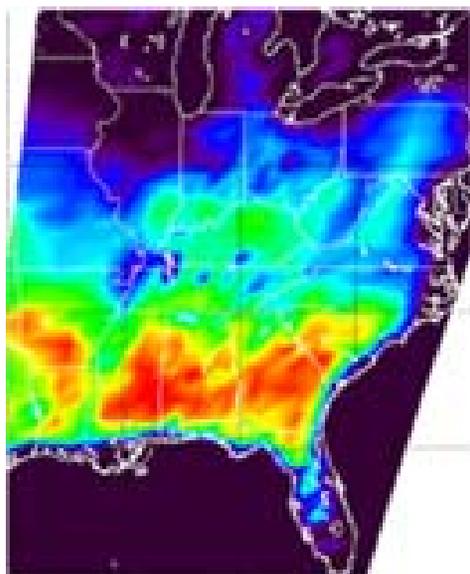AIRS   HSB   VIS
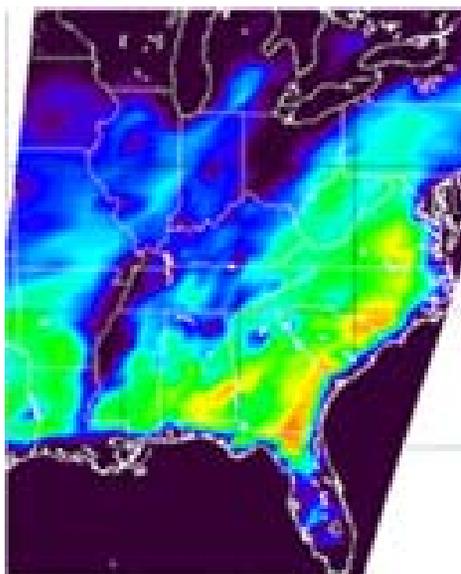
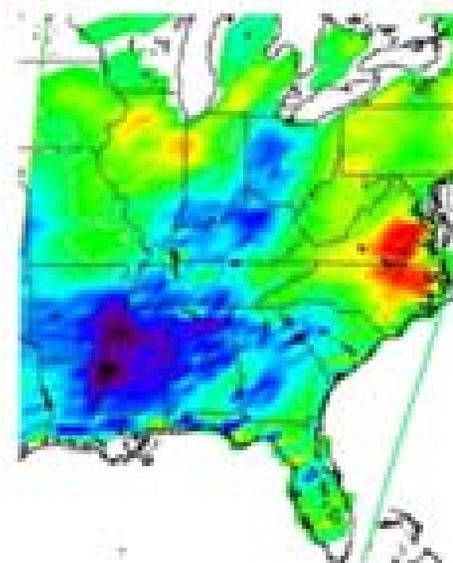# Isidore Aftermath per AIRS (AMSU)

Flooding of Mississippi Valley after 9/26 landfall

9/12/02   9/28/02   Diff

The AIRS Validation Strategy

Approach:

– **First validate radiances for clear sky, nighttime ocean**

– **Retrieve temperature and humidity over clear, night ocean**

– **Examine increasingly complex cloud and land surface conditions.**

Validation data:

– **Atmosphere: Raobs (op'l + dedicated); ground sites (ARM/CART etc.); forecasts**

– **Ocean: Buoys**

Status:

– **Initial comparisons for surface temperature are very promising**

- Clear-sky radiances from NCEP and ECMWF reanalyses for oceanic window channels show differences of ~0.5 K.

– **Other spectral regions are more challenging**

- Errors are >1.0 K in stratospheric T, plus water and ozone bands
- Operational radiosondes give essentially the same results as reanalyses

– *Dedicated observations are crucial for understanding water vapor and other gases. The AIRS-dedicated observation period is nearly complete.*

September-average clear night ocean AIRS spectrum, 60S-60N (~10,000 total).
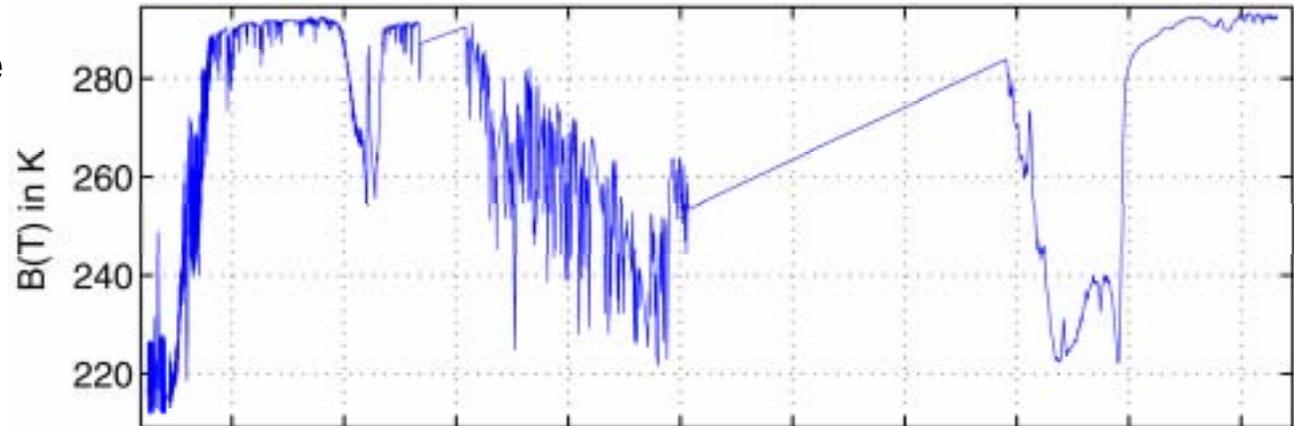
AIRS minus ECMWF; calculated bias and its daily-calculated standard deviation
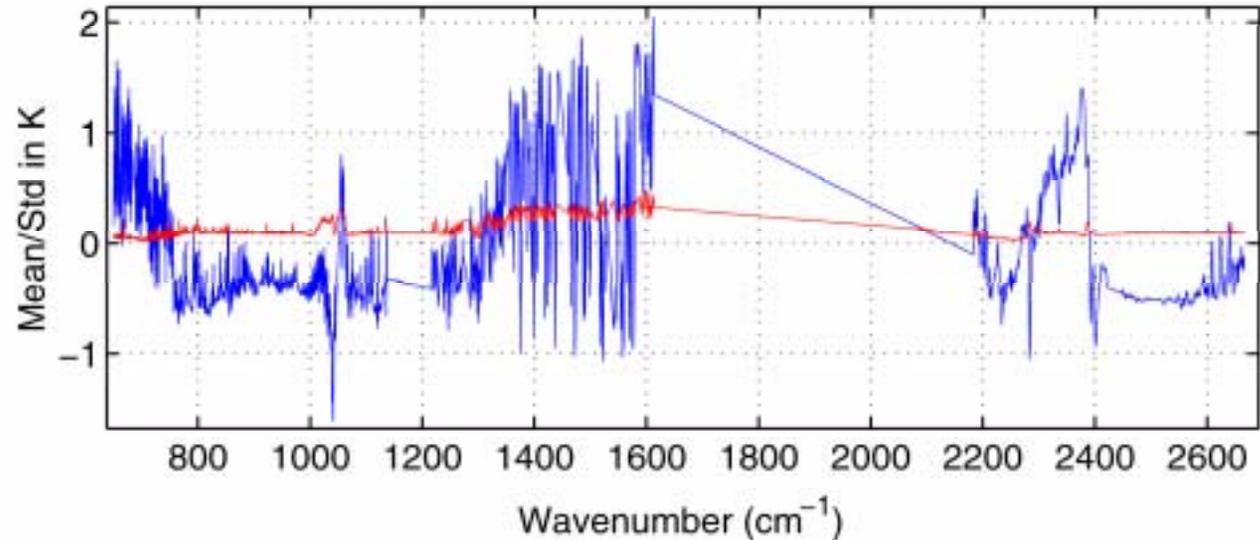
AIRS ← CAMEX

Validation challenges:
- **AIRS measurement accuracy probably exceeds that of standard in-situ sources**
- **Already it is becoming apparent that op'l models' q-profiles are 'challenged'**
- **Upper-tropospheric H2O is *most difficult* to validate (and most wrong in models)**
- **Cloud properties are difficult to validate**

Validation needs:
- **Water vapor measurements**
  - **Upper-tropospheric mixing ratios**
  - **Variability within 50-100 km footprint**
- **Cloud measurements**
  - **Liquid water profiles**
  - **Cloud top height**
  - **Spatial variability within 50-100 km footprint**

Bottom line:
- **Carefully designed field experiments are needed to 'nail down' H2O discrepancy**
- **CAMEX-5?**

AIRS ➔ CAMEX

Full synoptic soundings

- **3-D temperature & humidity fields**
- **Cloud parameters**
- **Available under all non-precipitating conditions**

Precipitation estimates

- **Pending validation**

Hurricane observations

- **Integrated view through multispectral sensor suite**
- **Soundings from top to bottom (unless precipitating)**

There is synergism between AIRS and CAMEX