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# AIRS Boundary Layer Products: Validation and Operational Use

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*transitioning unique NASA data and research technologies to the NWS*



***Motivation: Most weather occurs in the Planetary Boundary Layer (PBL), but observations are scattered point observations like METARs, RAOBs, ground-based sensors, and buoys. AIRS could add thousands of systematic observations of the PBL to aid forecasters.***

- ◆ Planetary Boundary Layer (PBL) Refresher/Tutorial
- ◆ UAH MPR and RSA Rawinsonde Validation Datasets
- ◆ Products for NWS WFOs
- ◆ Summary/Future Plans

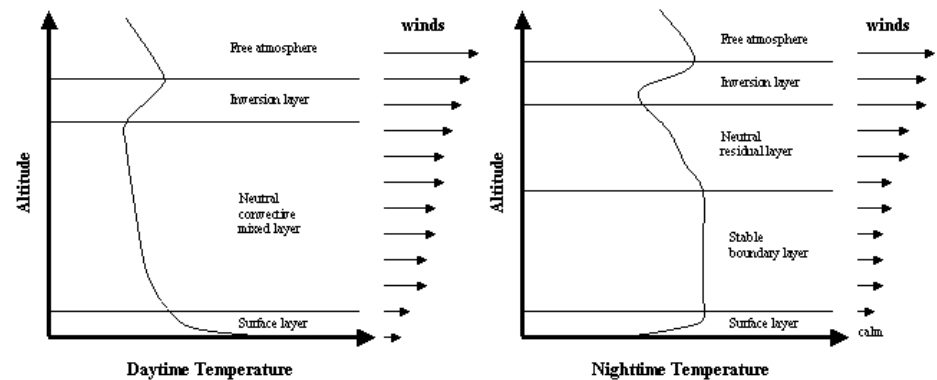


## Planetary Boundary Layer (PBL)



- ◆ The planetary boundary layer (PBL) is the lowest 1-2 km influenced by:
  - friction (slows and redirects winds)
  - evapotranspiration (modulates moisture)
  - heat and energy transfer (radiation and convection; modulates temperature)

- ◆ Two types of PBLs:
  - stable (nocturnal): characterized by cool surface with capping
  - unstable (afternoon): characterized warm air near surface



- ◆ AIRS may aid in detection of:
  - destabilization in unstable PBL that can lead to convection
  - depth of stable PBL that can cause fog, smoke, or low clouds to linger near the surface and disrupt travel or cause serious health risks

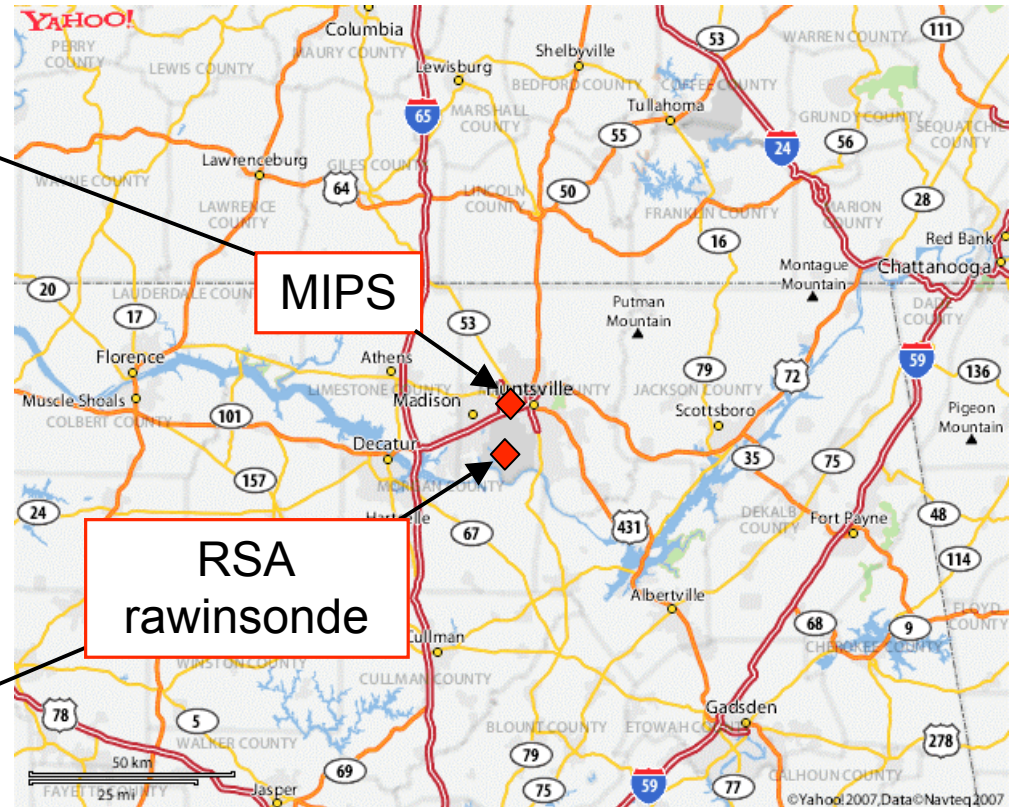




# Mobile Integrated Profiling System (MIPS)

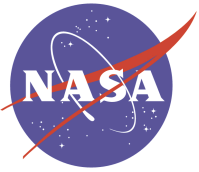


- MIPS stationed at NSSTC in Huntsville



- 12Z rawinsonde launched from Redstone Arsenal (approximately 10 km south of NSSTC)

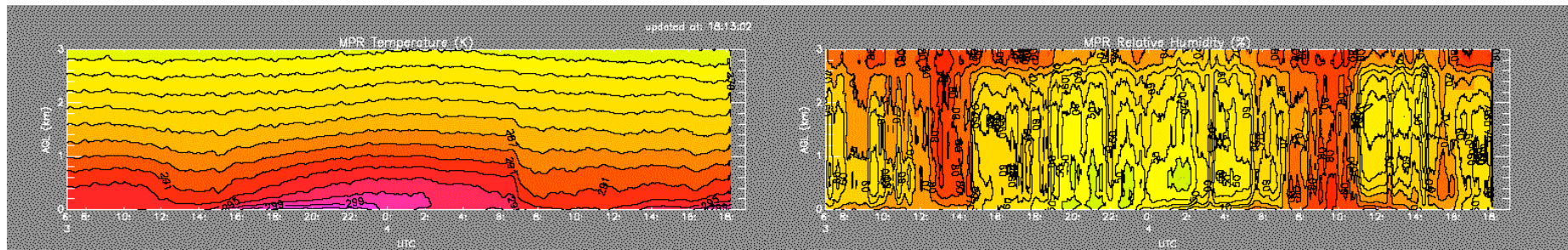




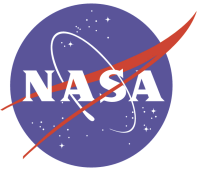
## Microwave Profiling Radiometer (MPR)



- ◆ MPR is one component of MIPS instrument suite
- ◆ Generates temperature, dew point, and liquid water profiles at vertical resolution of 100 m below 1 km and 250 m above 1 km every minute
- ◆ Temperature accuracy:
  - 1.0 K from surface to 2 km
  - 1.5 - 2.0 K from 2-10 km
- ◆ Moisture accuracy:
  - 0.2 - 0.3 gm<sup>-3</sup> from surface to 2 km
  - 1.0 - 1.5 gm<sup>-3</sup> from 2-10 km

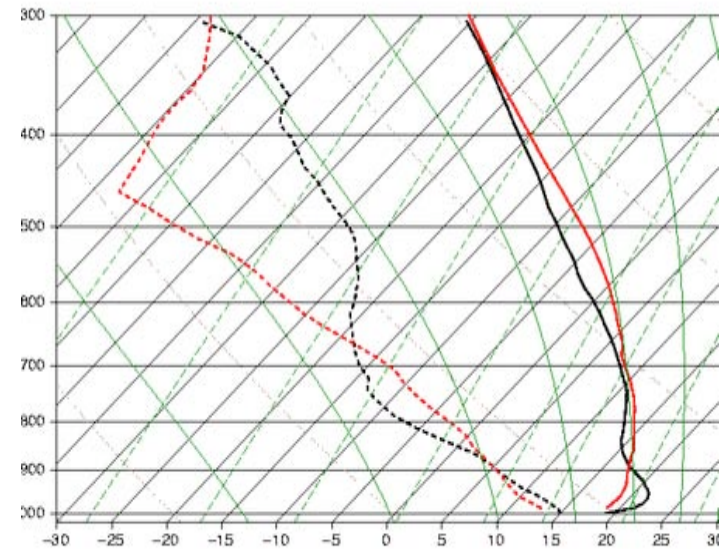


transitioning unique NASA data and research technologies to the NWS

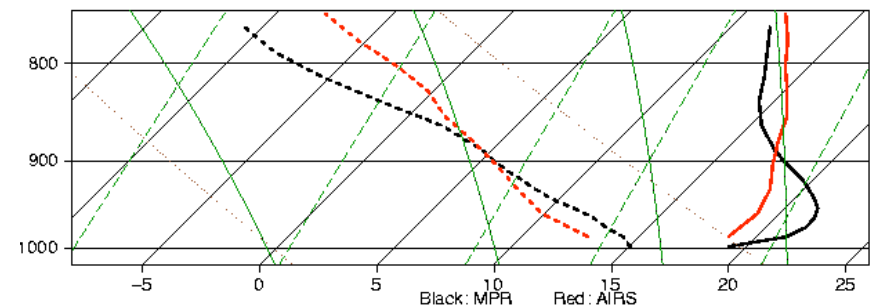


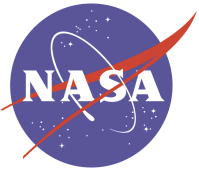
- ◆ SPoRT uses UWDB profiles (currently V4; soon V5) AIRS temperature and moisture data to produce NRT comparisons between MPR and AIRS
- ◆ A sounding comparison is generated for the closest AIRS sounding within 75 km of the MPR location
- ◆ Results of these comparisons are available in NRT on SPoRT website
- ◆ Website provides ability to zoom to lowest 3 km of troposphere

[http://weather.msfc.nasa.gov/sport/mips\\_airs/investigations.html](http://weather.msfc.nasa.gov/sport/mips_airs/investigations.html)

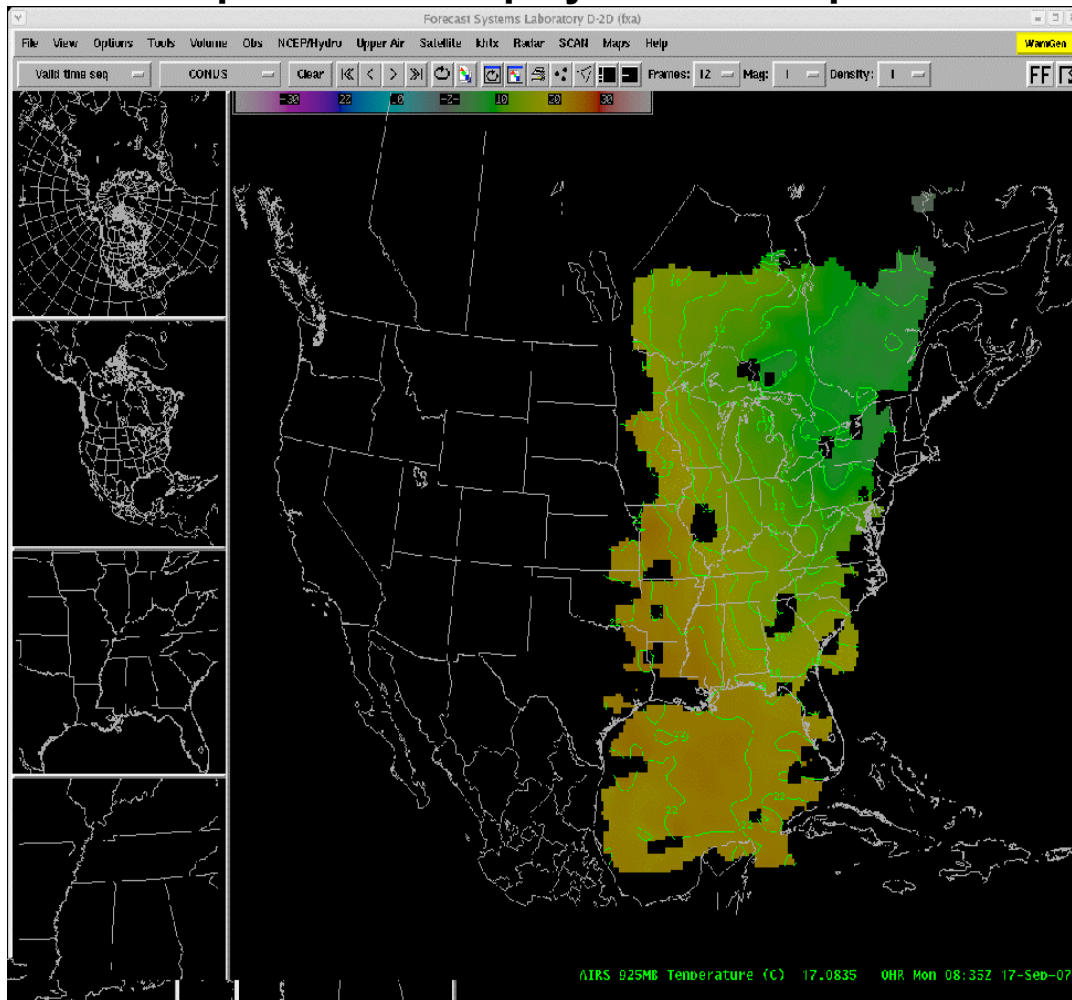


AIRS & MPR Boundary Layer valid for 0659 UTC on 10/02/2007  
Distance: 31 km

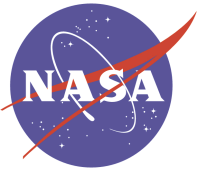




## Sample AWIPS display of an AIRS product



- ◆ Forecasters will only use data in their native system (AWIPS)
- ◆ Use AIRS to fill in temporal voids in radiosonde data record
- ◆ Emphasis on real-time data access
- ◆ Possible PBL products:
  - PBL height
  - mean PBL T and q
  - stability parameters (LCL, mean lapse rate, etc.)
- ◆ Work with forecasters to assess added value of product by use of online surveys



- ◆ SPoRT, through its partnership with UAH has access to unique datasets in the MPR and RSA radiosondes for validating AIRS PBL capabilities
- ◆ AIRS derived products can be a valuable asset to address NWS forecast problems associated with the atmospheric boundary layer
- ◆ Finalize comprehensive plan to:
  - validate real-time V5 AIRS profiles in the lowest 3km using MPR and RSA radiosonde data over northern Alabama
  - produce unique real-time boundary layer products (e.g. PBL height, mean PBL T, q and stability) from AIRS in AWIPS format to address NWS forecast problems
  - look at transitioning AIRS products to operations in the NWS Southern Region (assessment of product utility for NWS)

