Version 6 Testing
Overview and summary

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AIRS/Sounder Science Team Meeting

Greenbelt, November 13-16, 2012
Test team

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Objectives

• Sanity checks
  – Are the results reasonable?

• Embarrassment trap
  – We want to catch them before the users do

• What’s new/different?
  – Improvements
  – New products

Testing ≠ Validation!
Trends and yield

V6 reduces bias and yield trends

Yield trend

T-bias trend

q-bias trend

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AIRS STM: V6 Testing
Lambrigtsen  4
Water vapor

Testing against dedicated sondes

V6 reduces RMS errors

V5: Red
V6: Blue
Temperature

Vs. operational sondes

DJF '05/06

JJA '06

DJF '05/06

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Surface air temperature

Significant improvements over ocean
Also improvements over land
Significant improvements in emissivity

V6 improves quality/yield

LST & emissivity
SST & emissivity

7-Day Surface Skin Temperature (K) Non-Frozen Ocean
Retrieved minus ECMWF AM/PM Average

V6
V5

Improved SST accuracy

Improved emissivity

Higher yield
Retrieved 50-GHz emissivity

- V5: With ch. 5
- V6: W/out ch. 5
- V5-V6

Calibration noise in AMSU ch. 5 causes striping
Propagates into retrievals
Ch. 5 not used in V6

2002
Ch. 5 OK

2011
Ch. 5 bad
Cloud top properties

**V5**

7 DAYS JAN 2007, LAND, SINGLE LAYER, V5

- AIRS, DAY
- CALIPSO, DAY
- CLOUDSAT, DAY
- AIRS, NIGHT
- CALIPSO, NIGHT
- CLOUDSAT, NIGHT

**V6**

7 DAYS JAN 2007, LAND, SINGLE LAYER, V6.0.2

- AIRS, DAY
- CALIPSO, DAY
- CLOUDSAT, DAY
- AIRS, NIGHT
- CALIPSO, NIGHT
- CLOUDSAT, NIGHT

**V5**

7 DAYS JAN 2007, LAND, DOUBLE LAYER, V5

- AIRS, DAY
- CALIPSO, DAY
- CLOUDSAT, DAY
- AIRS, NIGHT
- CALIPSO, NIGHT
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**V6**

7 DAYS JAN 2007, LAND, DOUBLE LAYER, V6.0.2

- AIRS, DAY
- CALIPSO, DAY
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- CALIPSO, NIGHT
- CLOUDSAT, NIGHT

AIRS is now much closer to CALIPSO and CloudSat topmost cloud top height
NEW: Cloud phase & ice cloud properties

Jan. 2007 monthly mean maps of cloud, ice, liquid and “unknown” frequency. The cloud thermodynamic phase is determined at the AIRS pixel-scale using spectral channel differences and the Standard Level 2 effective cloud fraction product. All scan angles and AIRS FOVs are included.

Pixel-scale comparisons of MODIS and AIRS ice cloud effective radius (bottom) and optical thickness (top) for AIRS FOVs with ice cloud only, per the MODIS cloud mask. (15 days from Jan. 2007.)
Global OLR and Clear Sky OLR
AIRS minus CERES Edition 2.6r EBAF
September 2002 through June 2011

Mean Difference
W/m²

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Better agreement with CERES

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AIRS STM: V6 Testing
Lambritsien 13
Trace gases

**CH₄:** Increased DOF in V6

**O₃:** Bias vs. OMI reduced in V6

**CO:** Higher yield in V6
Significantly improved yield and coverage in V6
NEW: Boundary layer

Looks reasonable
Cloud cleared radiances

Reasonable bias:
Cloud-cleared 1231 cm\(^{-1}\) vs. SST

±60°
all cases

30°N-60°N
25-50% cloudfrac
Minor differences between V5 and V6:
No change in $\Delta T_b$ threshold

AIRS V6 ABS($\Delta T_b$) SO2 flag, May 27/2011

AIRS SO$_2$ flag

OMI SO$_2$ total column
Layer-to-level transformation

Water vapor structure is preserved
• Significant improvements in yield
• Bias trends now much lower
• Layer water vapor now also available as level quantities
• Two major new products: Ice cloud microphysics; BL height
• Ready to switch to AIRS-only if/when AMSU degrades further
• Validation will start as soon as production has ramped up