

Evaluation of analyzed and forecast IWV fields with SSM/I IWV over *open oceans*

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CMC 3D-Var Assimilation

Operational as of June 2001

AMSU-A *T_b* Level 1B (channels 3-10 over oceans & 6-10 over land): RTTOV
(Chouinard & Halle)

+HUMSAT ($T-T_d$ profiles) (Garand) “GOES imager Statistical: Cloud
Pattern Reg.”

Operational as of June 2003

AMSU-A *T_b* Level 1B (channels 3-10 over oceans & 6-10 over land) : RTTOV

+ AMSU-B *T_b* Level 1B (channels 2-5 over oceans & 3,4 over land): RTTOV
(Chouinard & Halle)

+ GOES-IMager radiance of water vapor channel (replaces HUMSAT):
physical forward model (Garand & Wagneur)



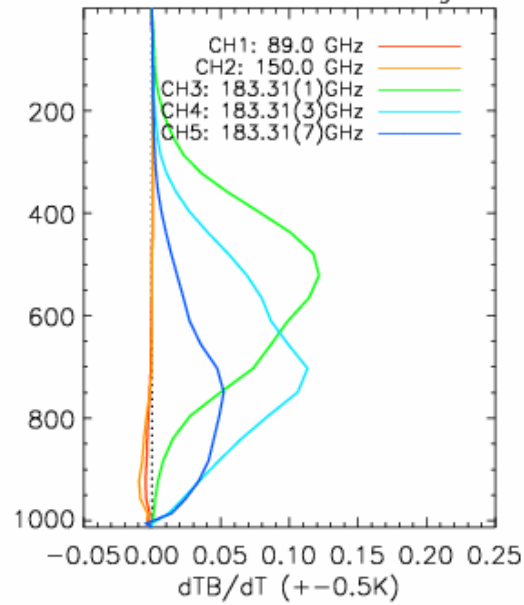
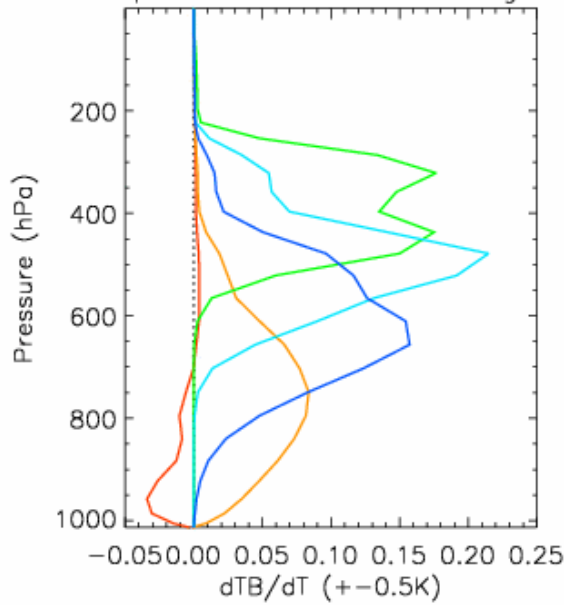
Clear-sky assimilation only

- Bennartz for AMSU-B
- Grody for AMSU-A

AMSU-B emiss=0.6 EIA=0°

Tropical Profile: TPW=52.46kgm⁻²

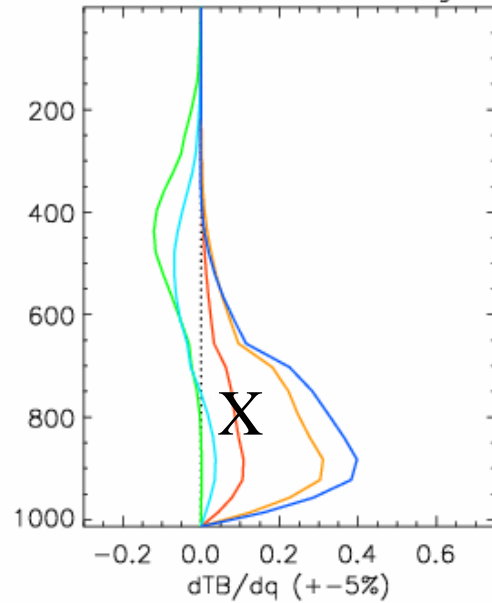
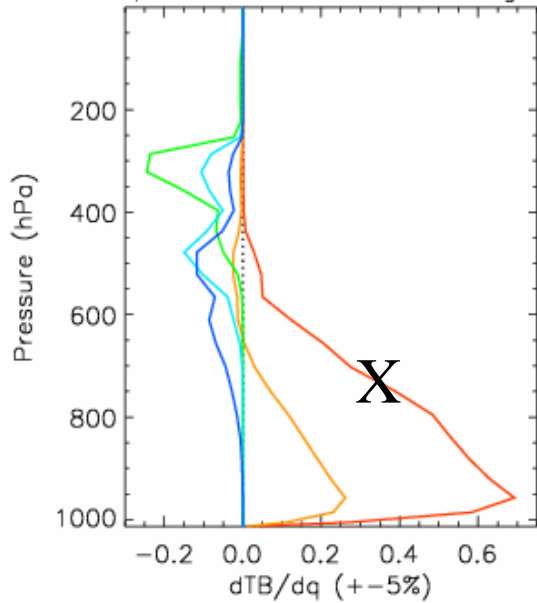
Arctic Profile: TPW=5.13kgm⁻²



AMSU-B
(RTTOV7)

Tropical Profile: TPW=52.46kgm⁻²

Arctic Profile: TPW=5.13kgm⁻²



Experiment Set Up

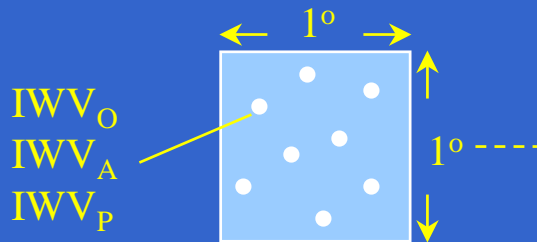
- Period: May 01 - May 31, 2003
- Control: **NOAMSUB**
AMSU-A Tb + HUMSAT T-Td profiles
- Experiment: **AMSUB**
AMSU-A Tb + AMSU-B Tb + GOES water vapour channel (6.7 μm) radiance
- compare with DMSP F15 SSM/I observations

Compute model IWV from analyses (A)
and trial fields (P_{6hr})

Compute IWV from SSM/I Tb
via regression equations (O)
(Alishouse et al. 1990,
Petty 1994)

Obs lat/lon coords

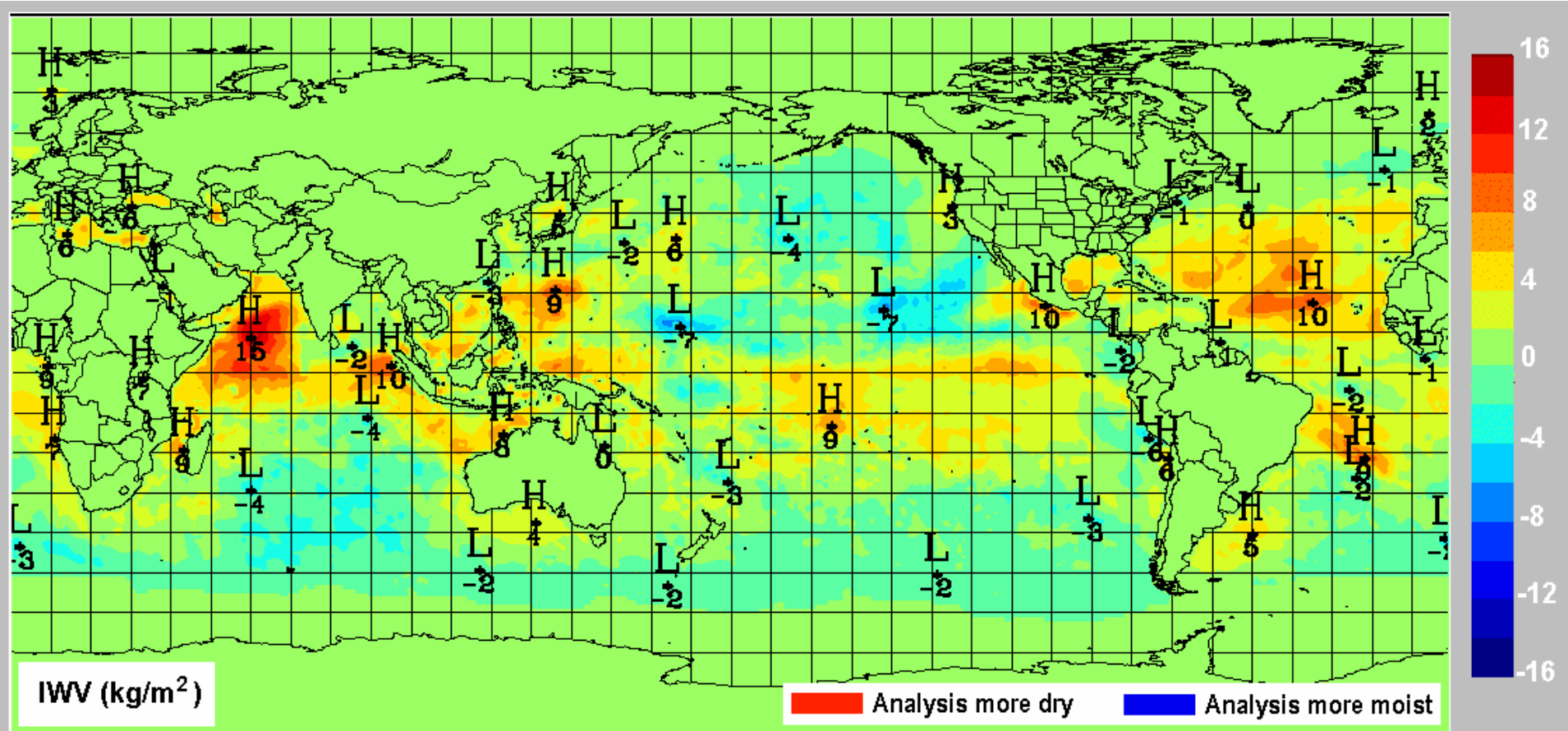
Interpolate model IWV fields to SSM/I obs
(for each 6 hr period; each sat. separately)



Compute mean O , A , P_{6hr} , $O-A$, $O-P_{6hr}$ IWV fields
over specified period on 1° lat x 1° lon global grid

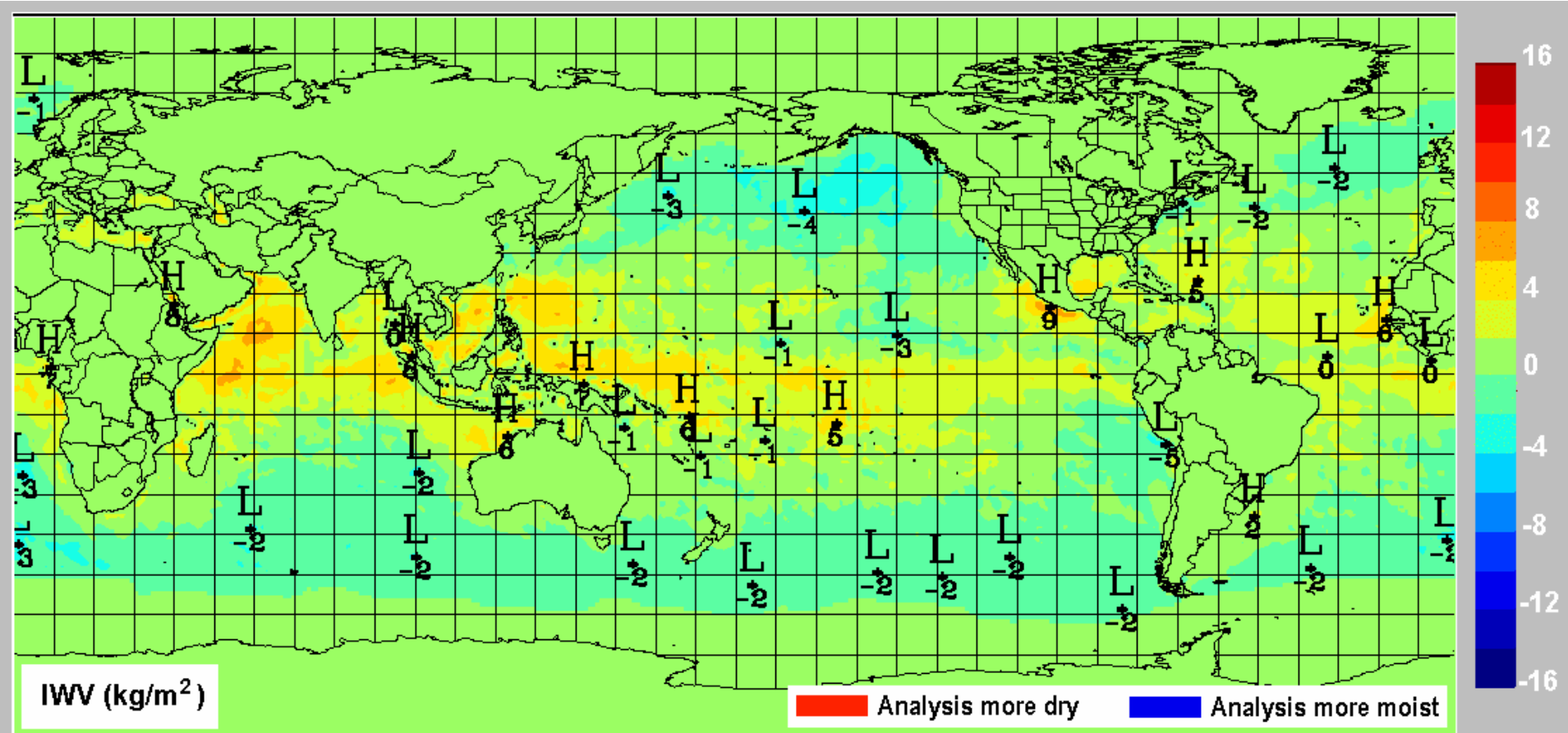
Mean fields/statistics calculated where min. of 100 pts
per $1^\circ \times 1^\circ$ box or $> 10\%$ of max.

Mean $\{O_{SSM/I} - A_{NOAMSUB}\} : IWV$



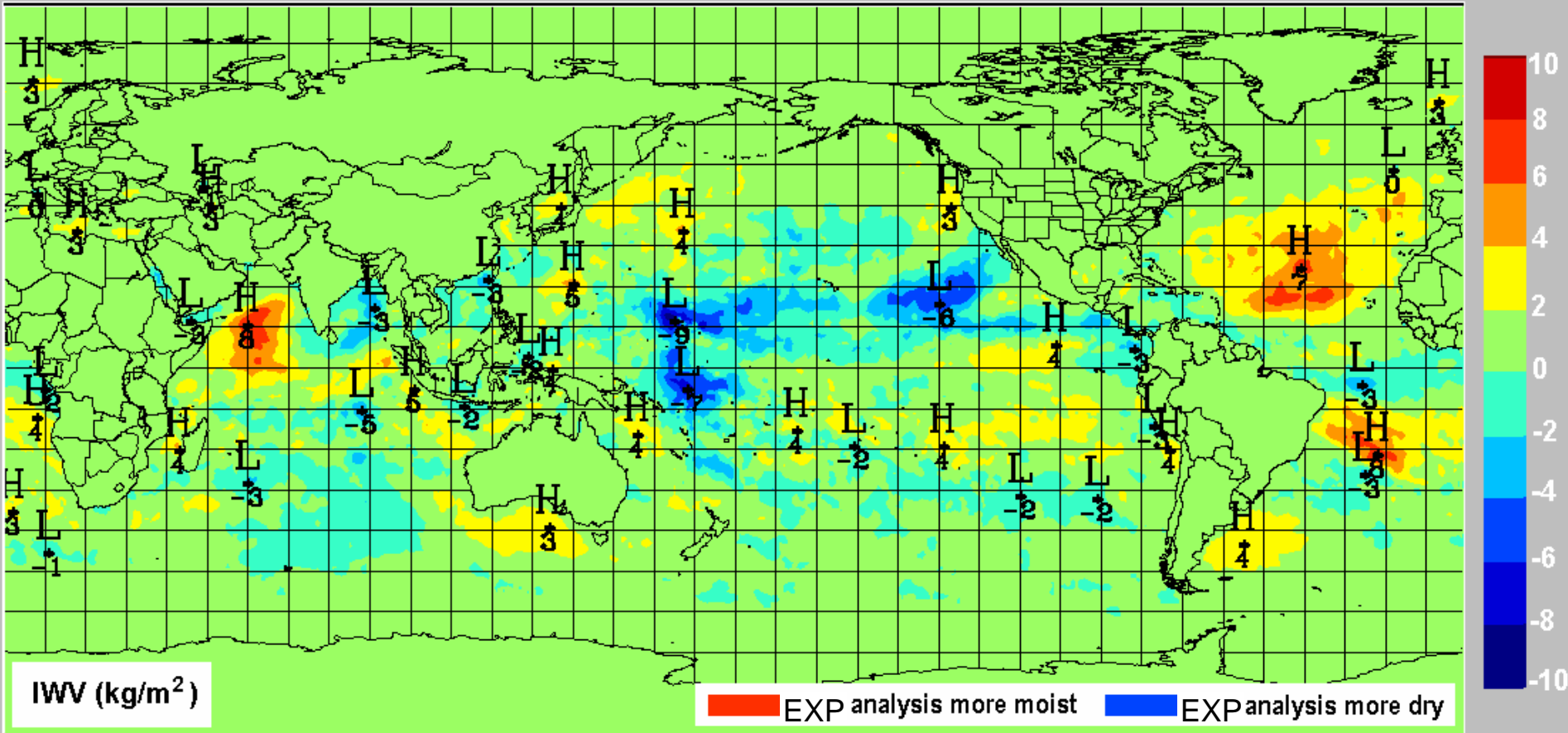
May 2003

Mean $\{O_{SSM/I} - A_{AMSUB}\} : IWV$



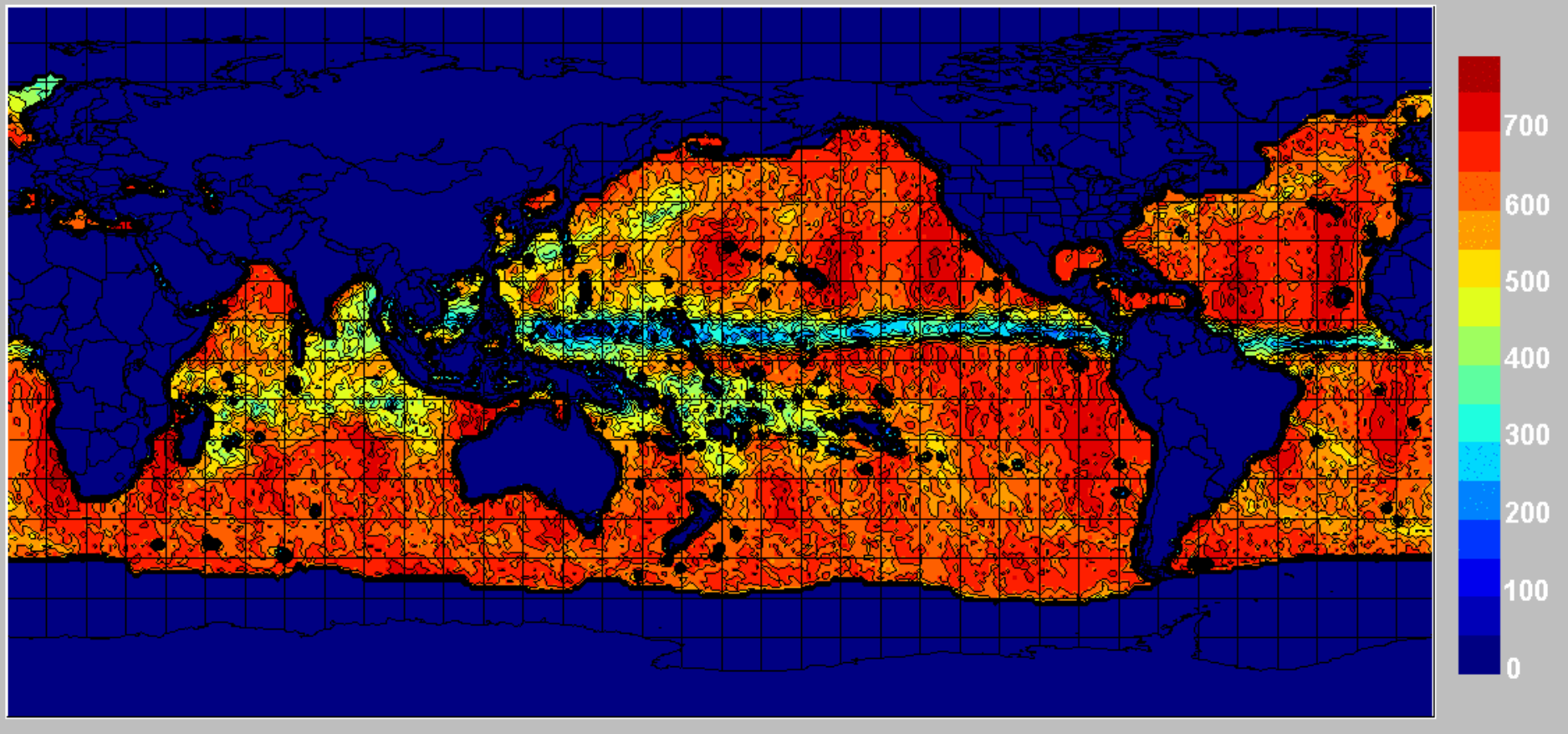
May 2003

Mean $\{A_{\text{AMSUB}} - A_{\text{NOAMSUB}}\}$: IWV



May 2003

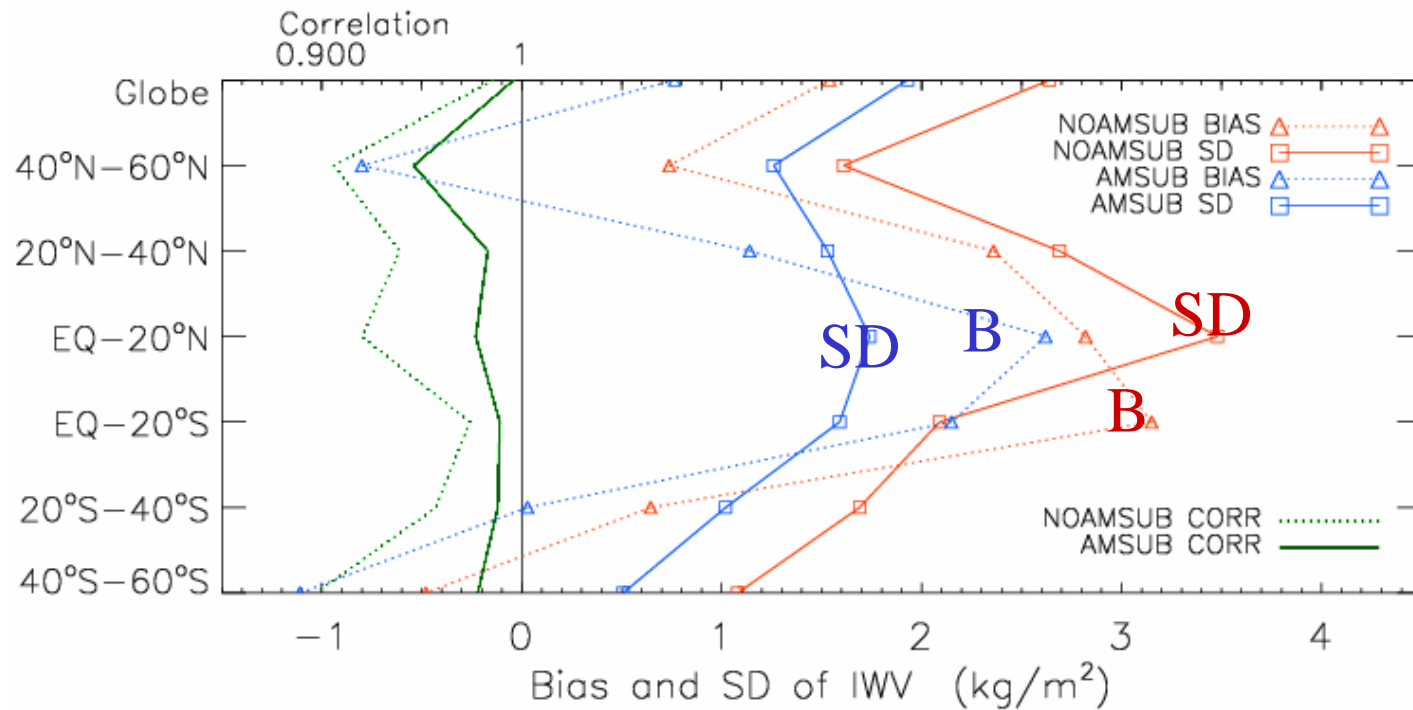
DMSP 15 SSM/I IWV Population Map



May 2003

SSM/I IWV vs. Analysed IWV

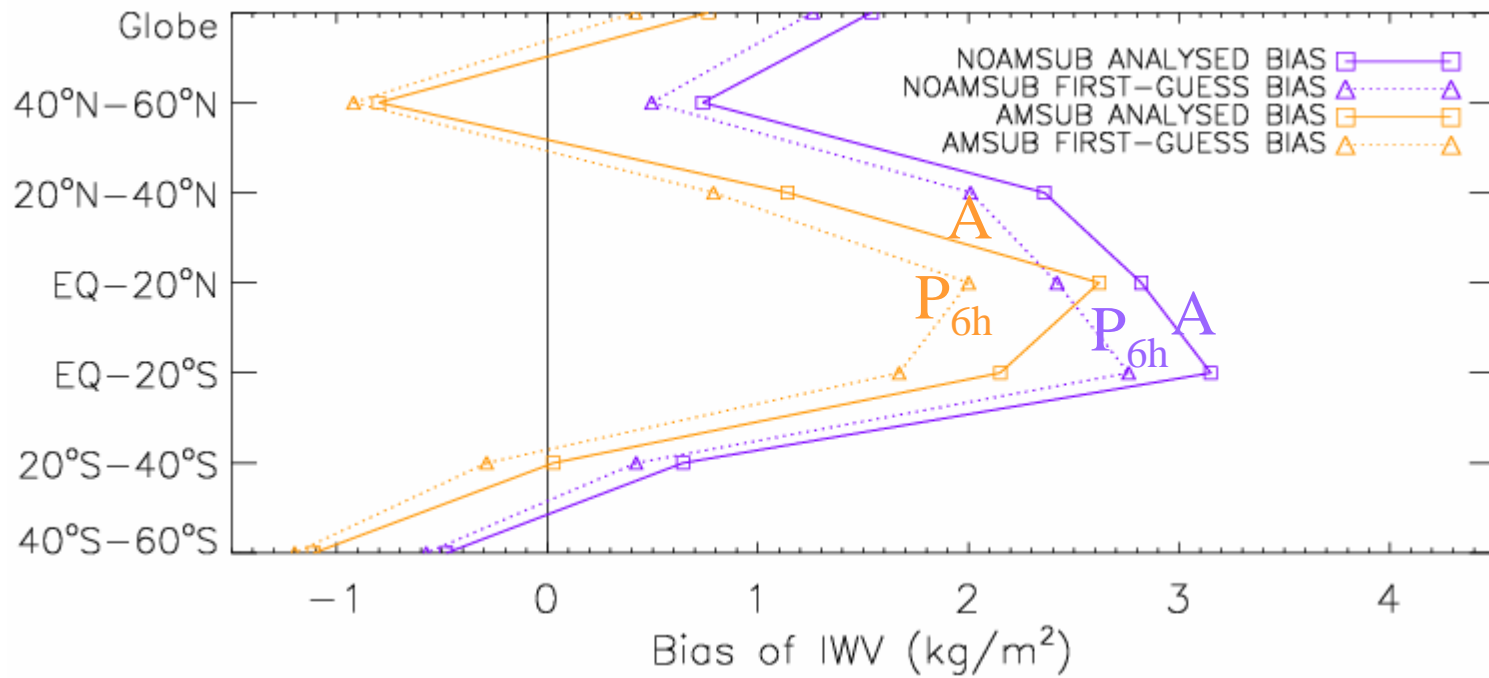
$$O_{SSM/I} - A$$



May 2003

$$O_{SSM/I} - A$$

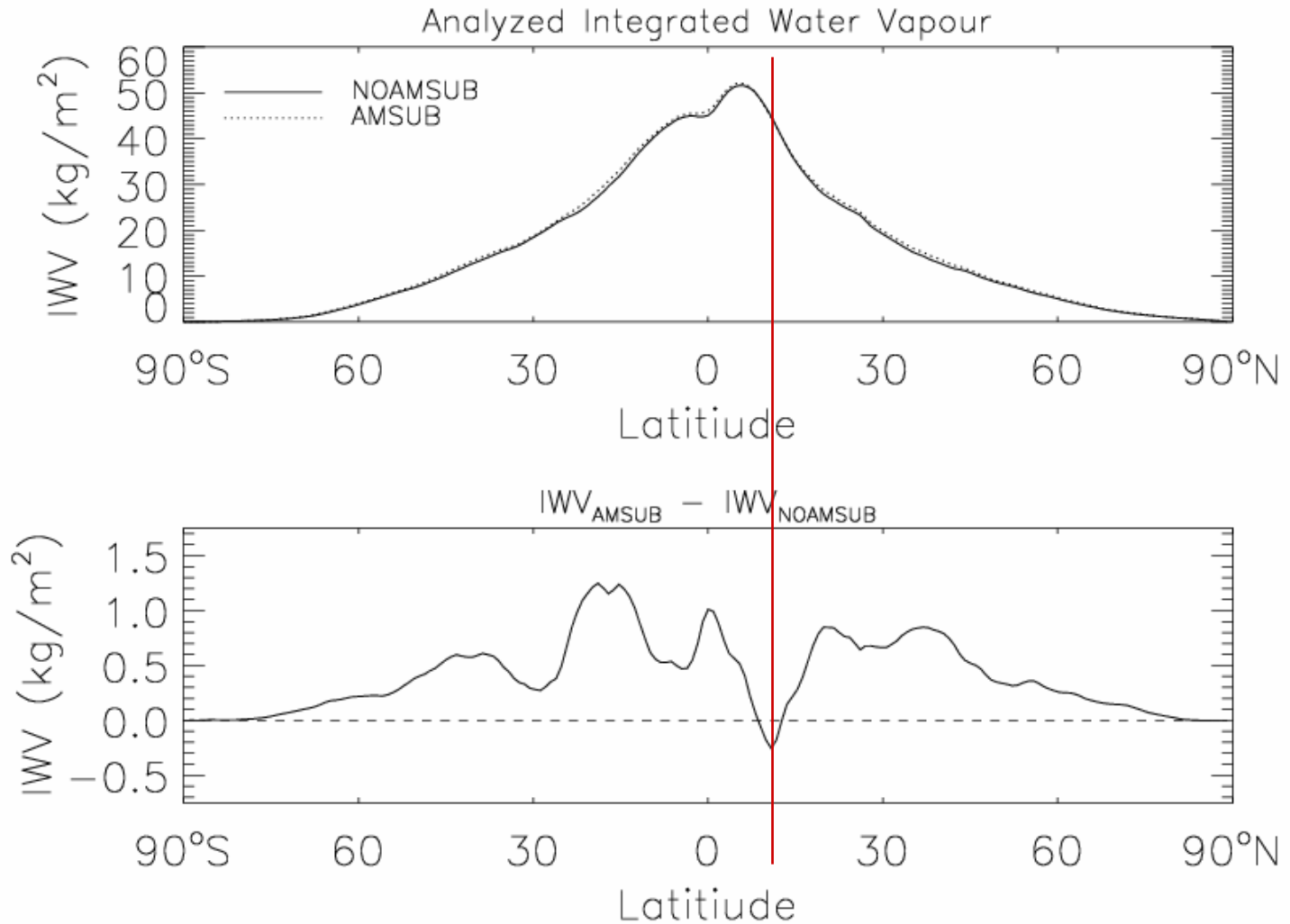
$$O_{SSM/I} - P_{6hr}$$



May 2003

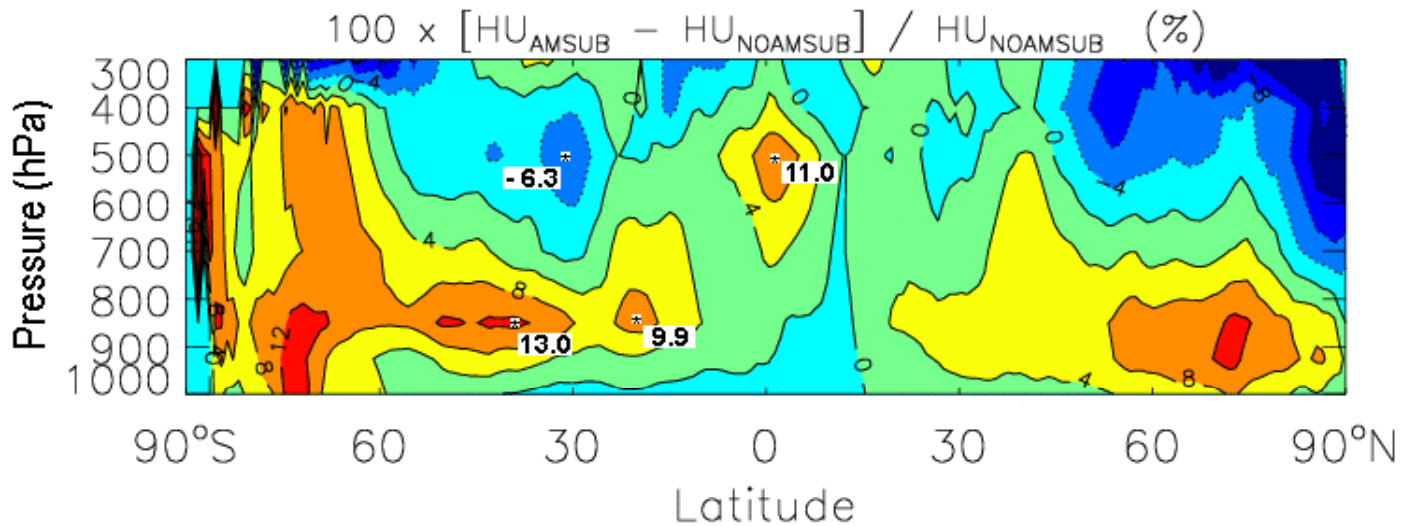
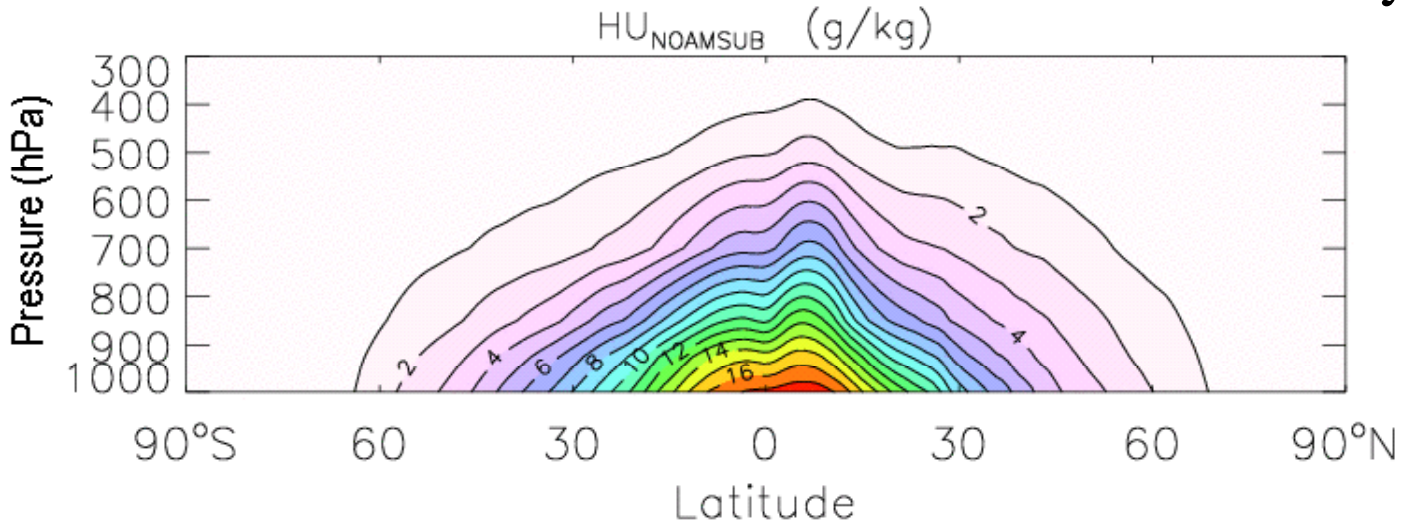
Analyzed IWV - zonal average

May 2003



Analyzed HU - Relative Change

May 2003



Conclusions

- new configuration results in analyses and trial field IWV values that match SSM/I observations much more closely
 - correlation between 60°S and 60°N increased from 0.932 to 0.977
- large deficit and surplus moisture areas are reduced
- increase in moisture almost everywhere on the globe
 - reduces dry bias between 40°S and 40°N
 - dry bias becomes a wet bias between 40°N and 60°N
 - wet bias becomes more enhanced between 40°S and 60°S
- most significant relative increases in moisture:
 - SH extratropics at 850 hPa, EQ at 500 hPa
- similar results for DMSP F14 and F13