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

David Anselmo & Dr. Godelieve Deblonde
Data Assimilation and Satellite Meteorology Division
Meteorological Service of Canada
Dorval, Quebec

International TOVS Study Conference - XIII
Ste. Adele, Quebec October 31st, 2003

CMC 3D-Var Assimilation

Operational as of June 2001

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

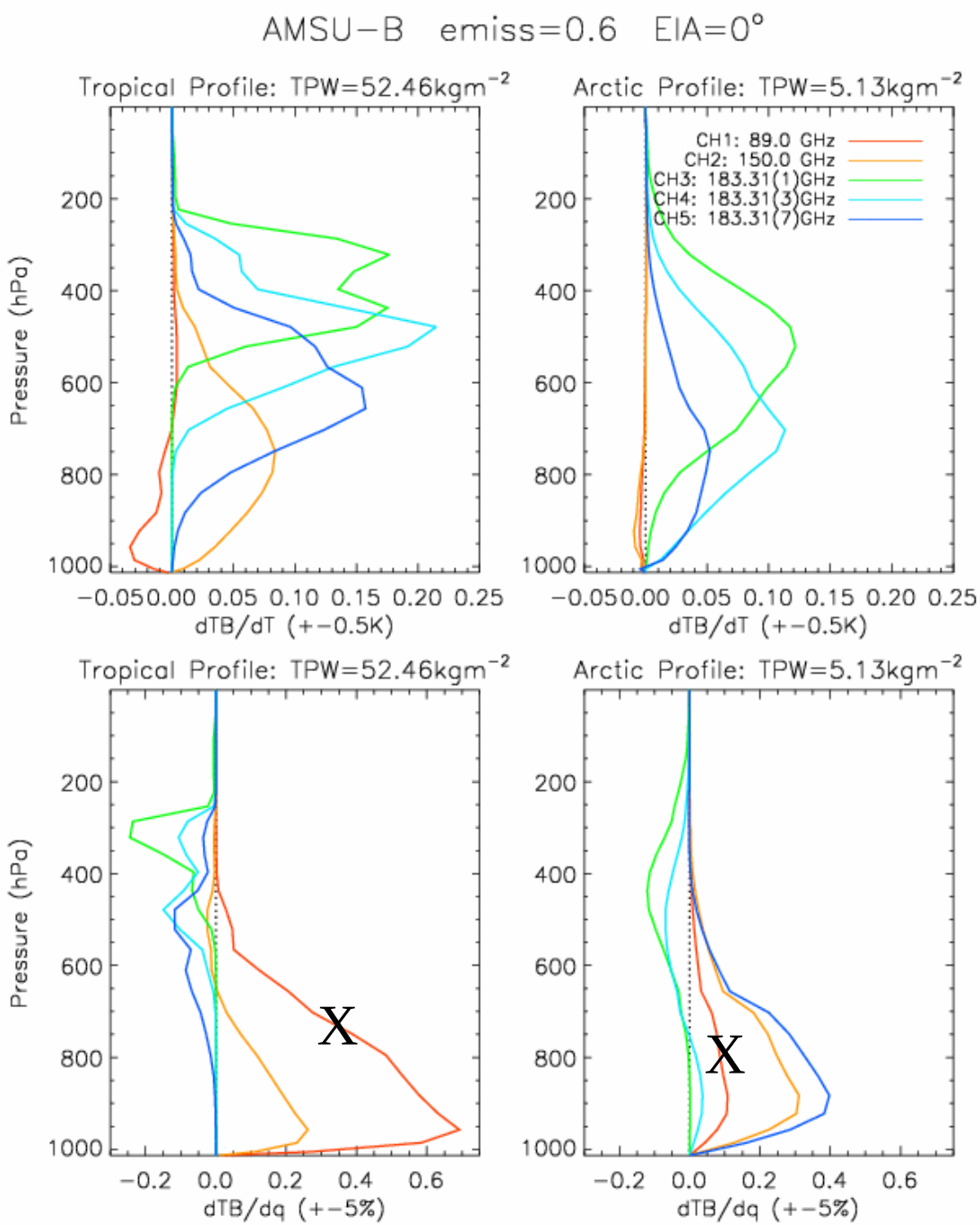
+ AMSU-B *Tb* Level 1B (channels 2-5 over oceans & 3,4 over land): RTTOV (Chouinard & Halle)

+ 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
(RTTOV7)



Experiment Set Up

- Period: May 01 - May 31, 2003
- Control: **NOAMSUB**

  AMSU-A Tb + HUMSAT T-Td profiles
- Experiment: **AMSUB**

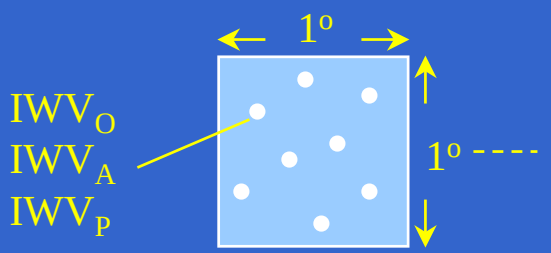
  AMSU-A Tb + AMSU-B Tb + GOES water vapour channel (6.7 μm) radiance
- compare with DMSP F15 SSM/I observations

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

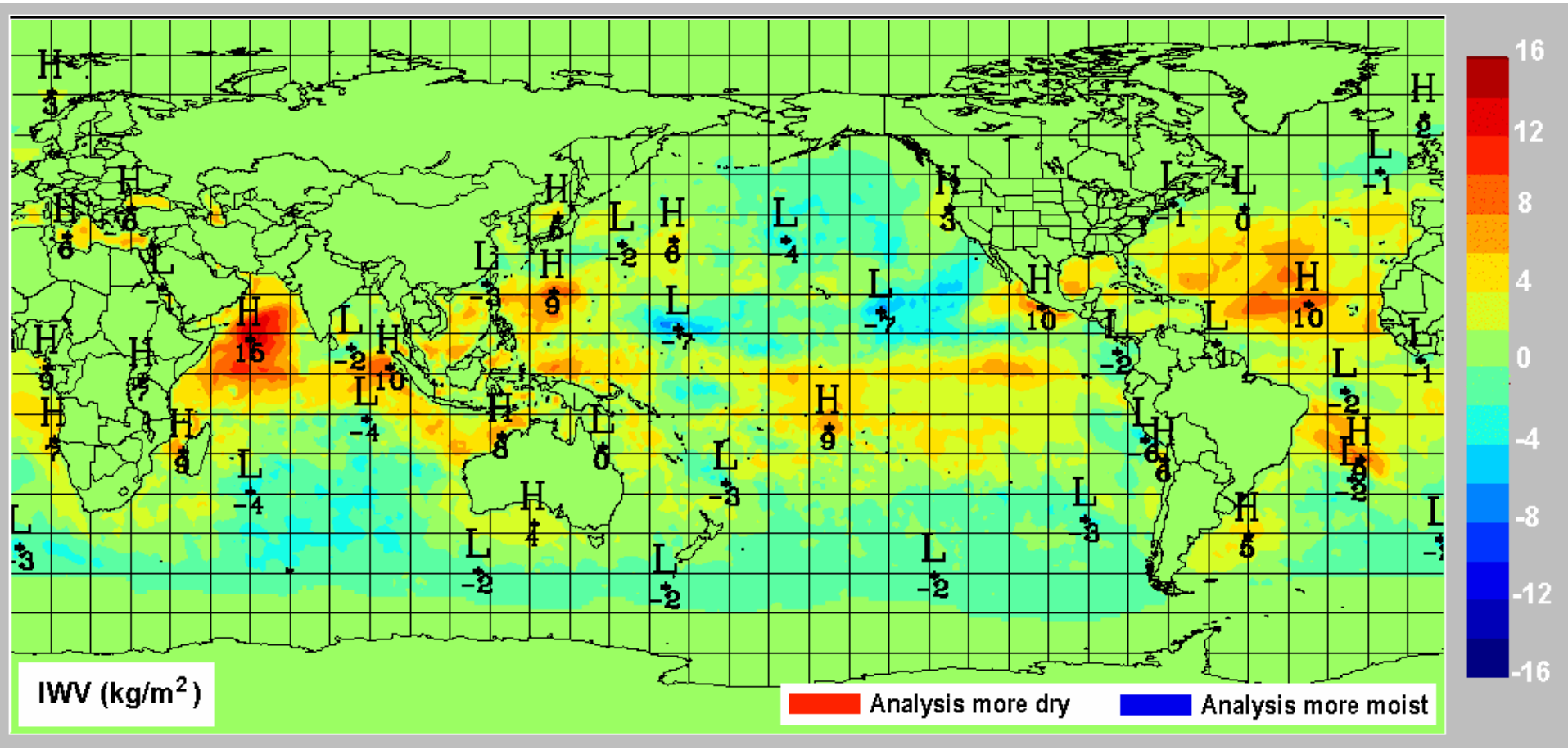
Interpolate model IWV fields to SSM/I obs
(for each 6 hr period; each sat. separately)



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

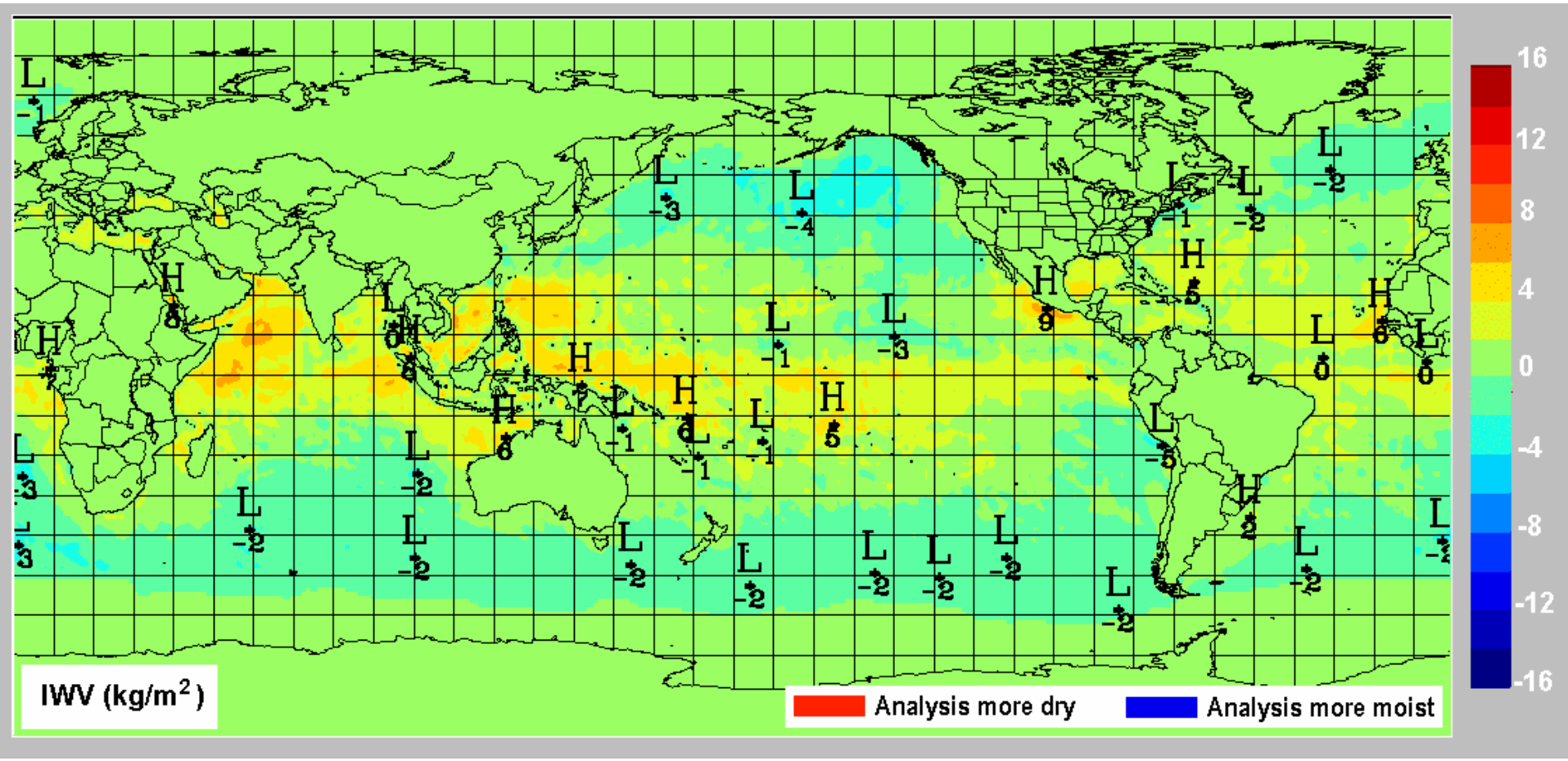
Mean fields/statistics calculated where min. of 100 pts per 1°x1° box or > 10 % of max.

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



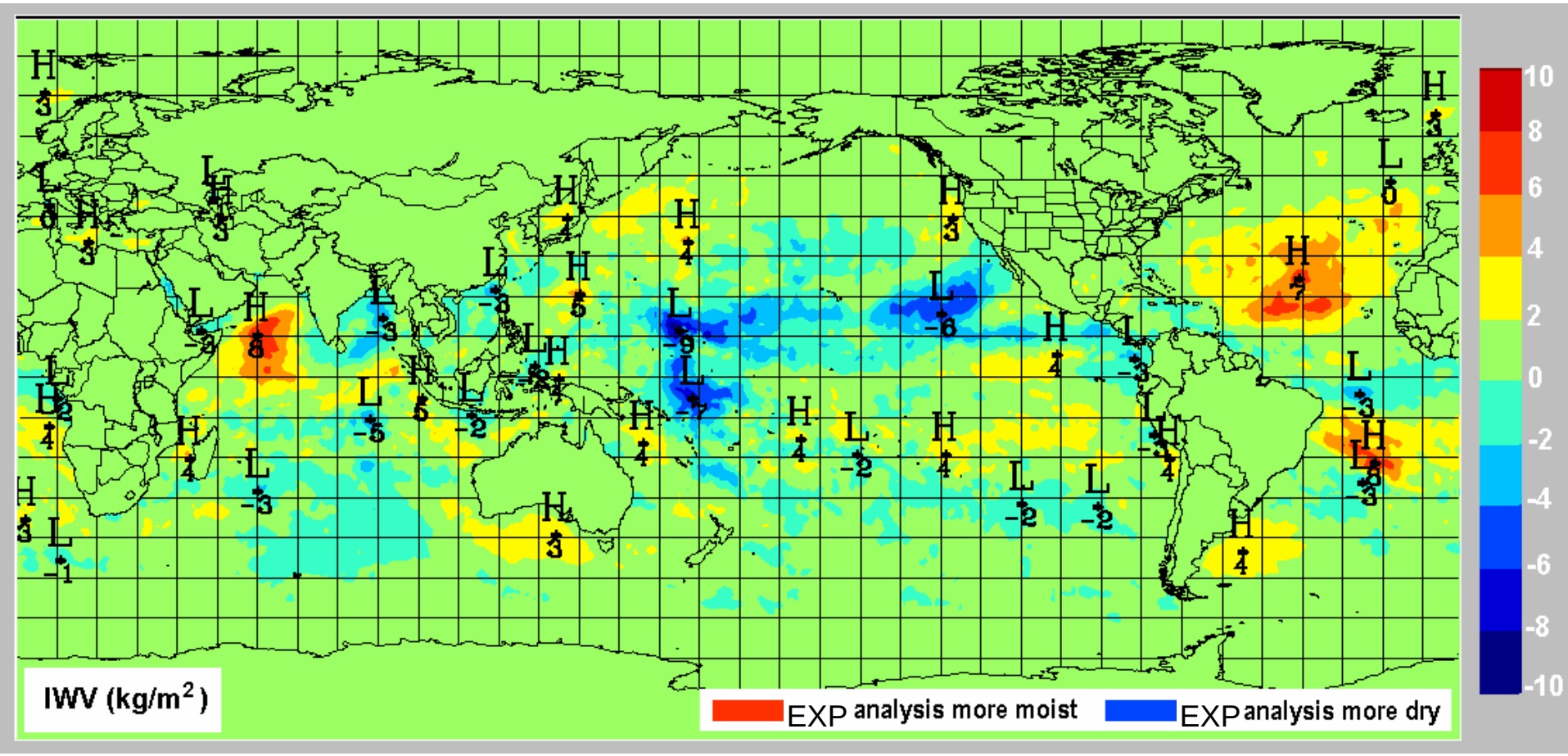
May 2003

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



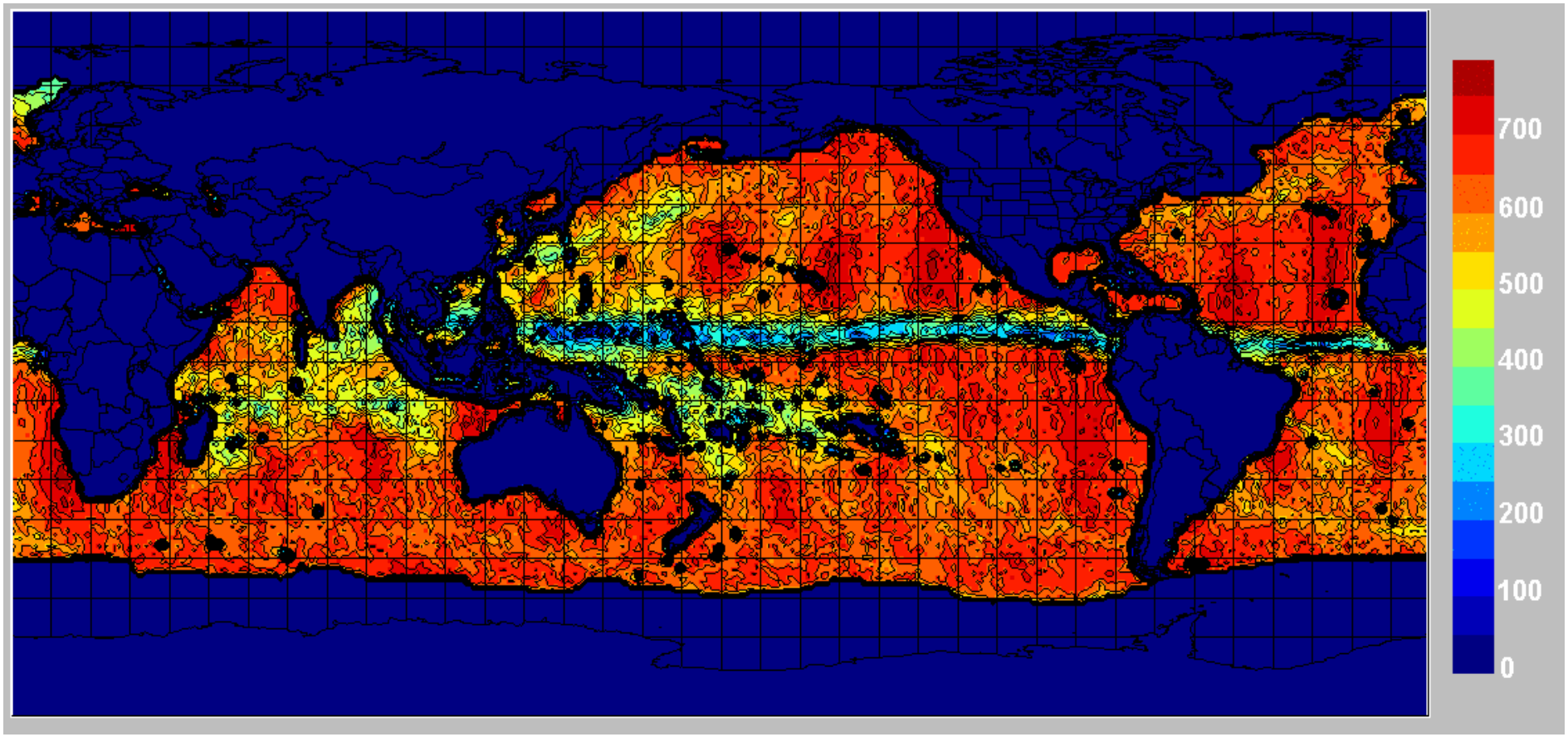
May 2003

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



May 2003

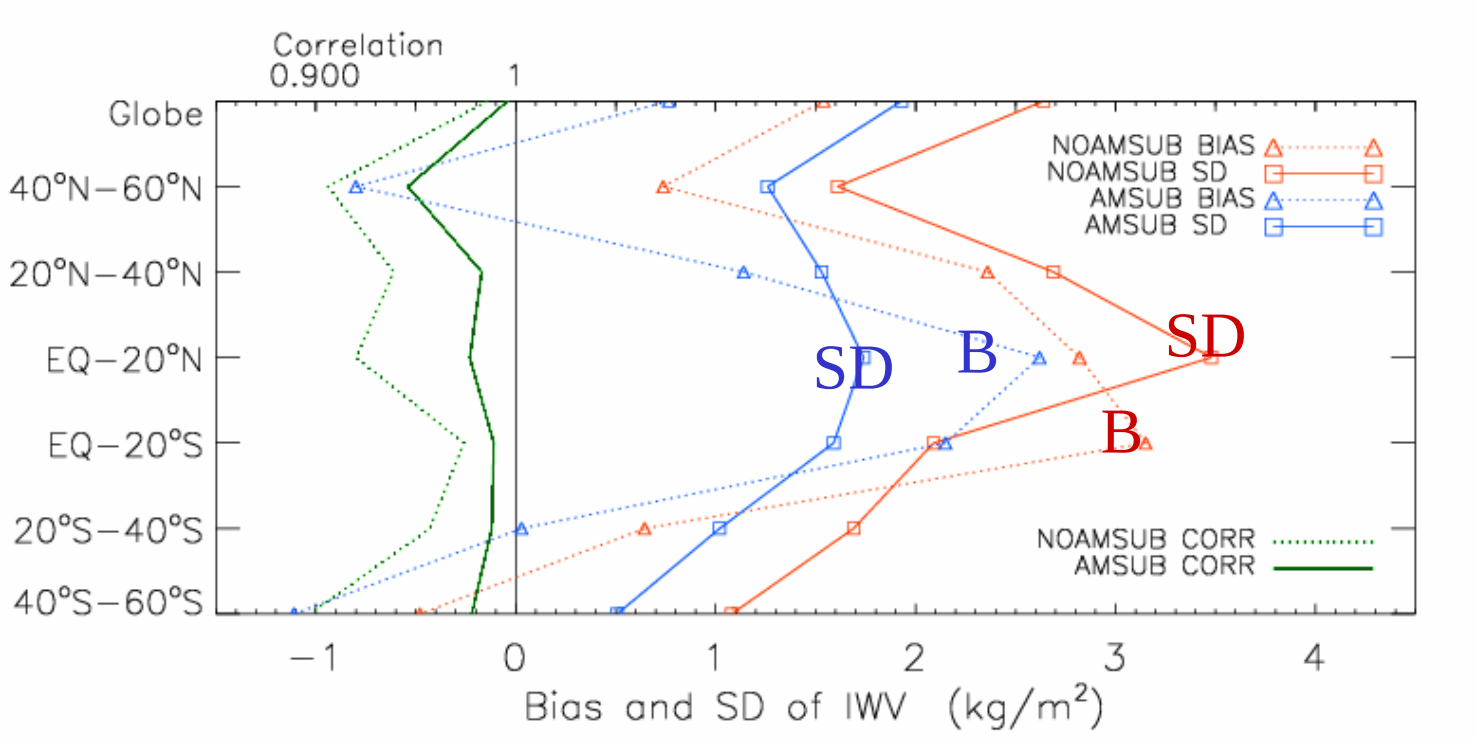
DMSP 15 SSM/I IWV Population Map



May 2003

SSM/I IWV vs. Analysed IWV

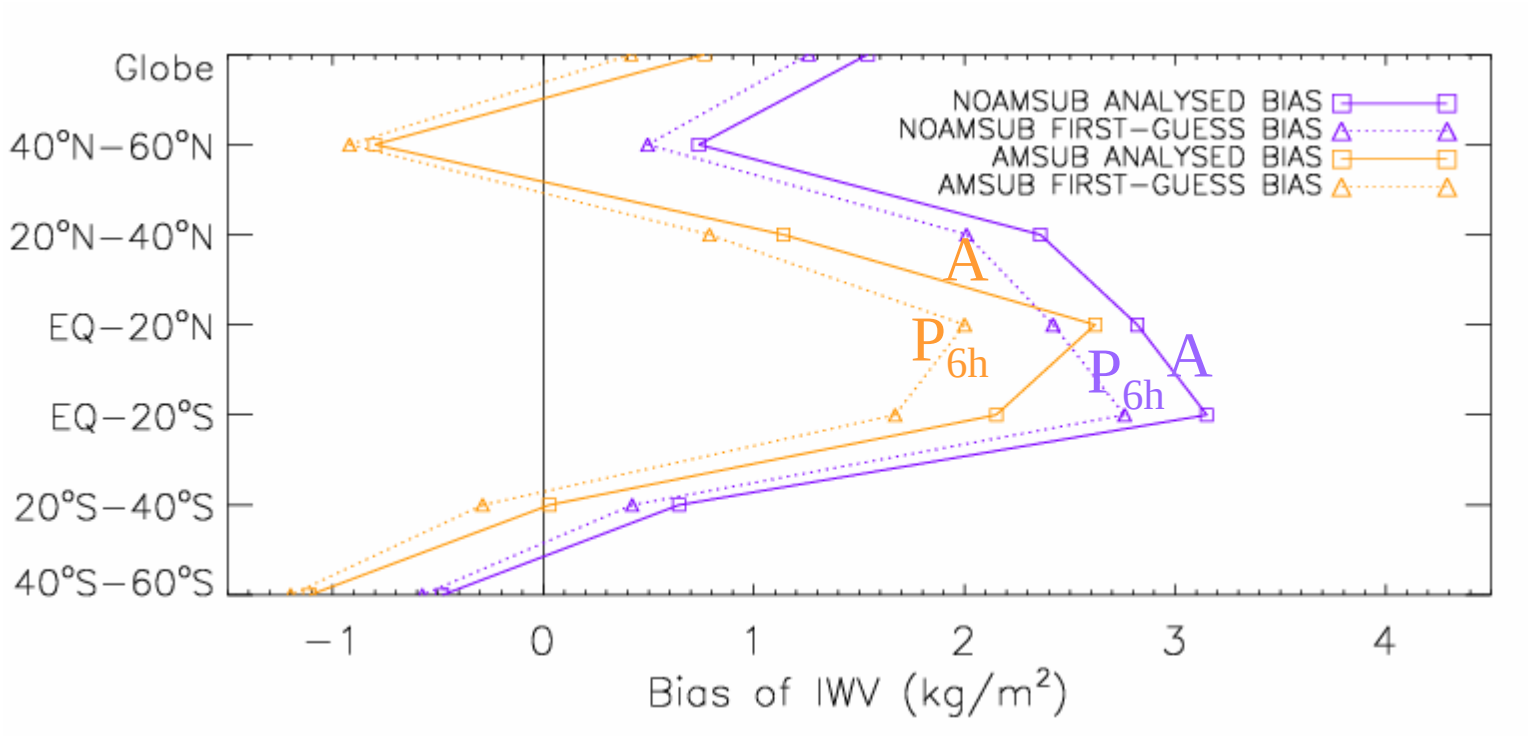
$O_{SSM/I}$ - A



May 2003

$O_{SSM/I}$ - A

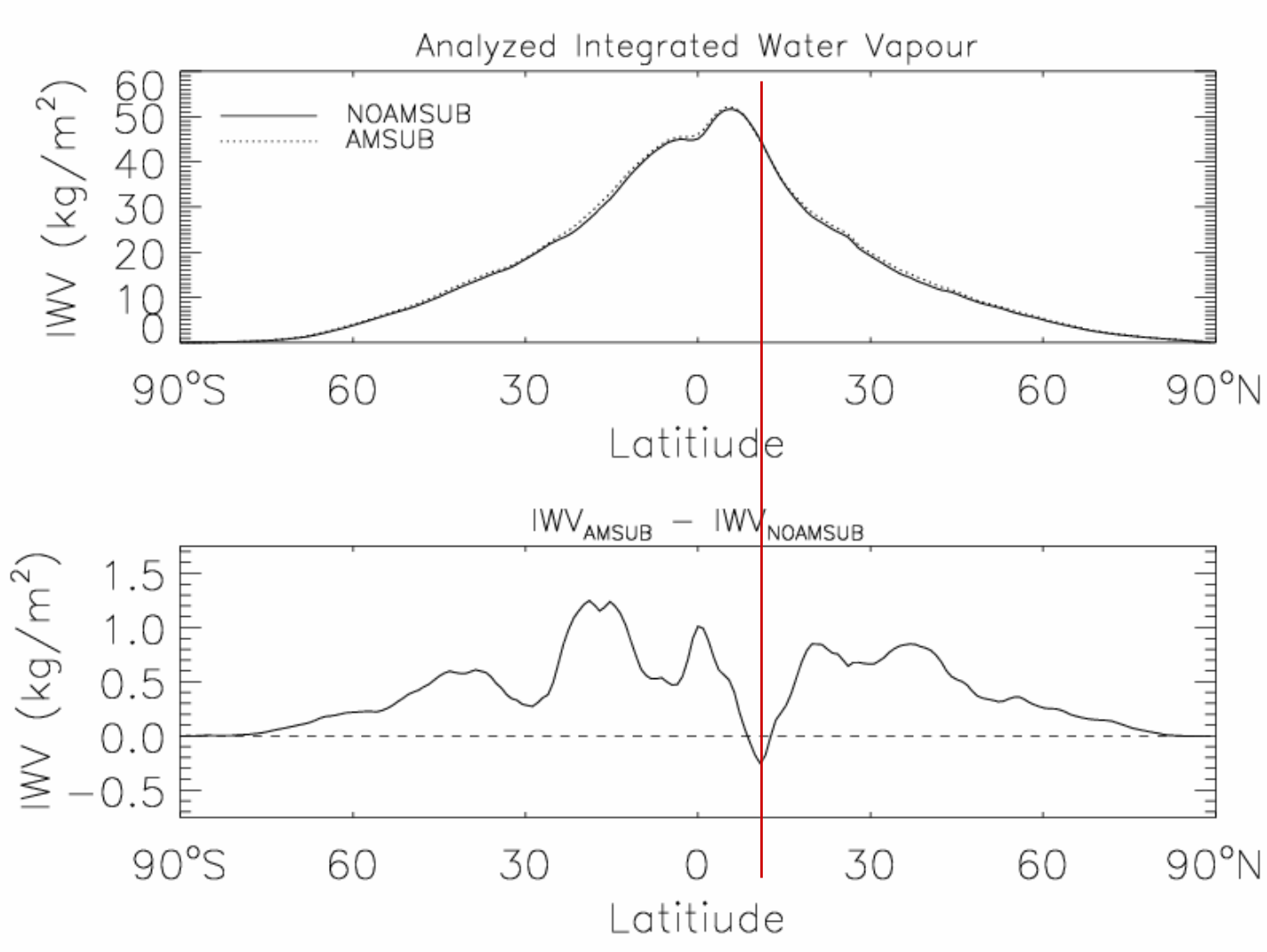
$O_{SSM/I}$ - P_{6hr}



May 2003

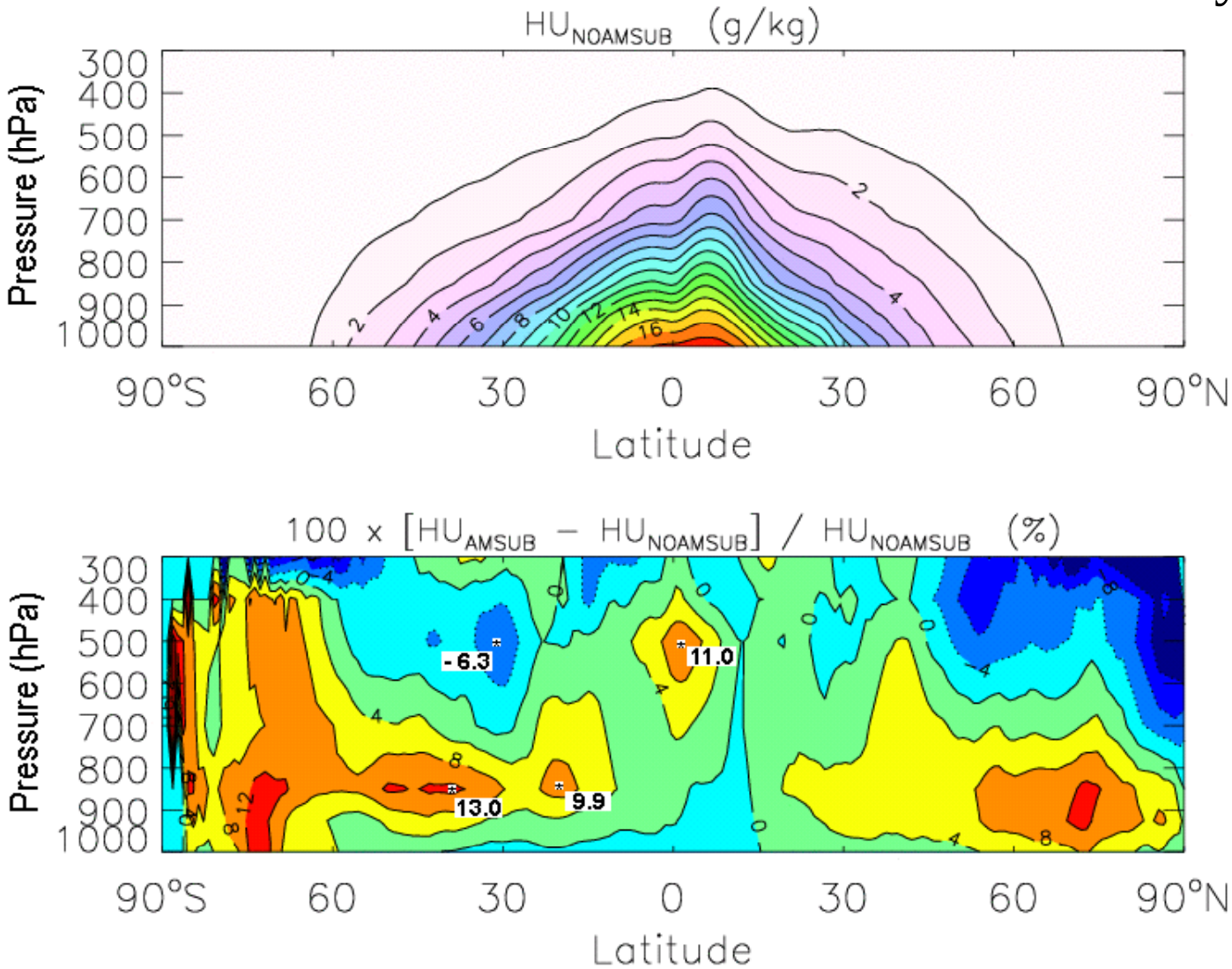
Analyzed IWV - zonal average

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^{o}S and 60^{o}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^{o}S and 40^{o}N
  - dry bias becomes a wet bias between 40^{o}N and 60^{o}N
  - wet bias becomes more enhanced between 40^{o}S and 60^{o}S
- most significant relative increases in moisture:
  - SH extratropics at 850 hPa, EQ at 500 hPa
- similar results for DMSP F14 and F13

International TOVS Study Conference, 13th, TOVS-13, Sainte Adele, Quebec, Canada, 29 October-4 November 2003. Madison, WI, University of Wisconsin-Madison, Space Science and Engineering Center, Cooperative Institute for Meteorological Satellite Studies, 2003.