

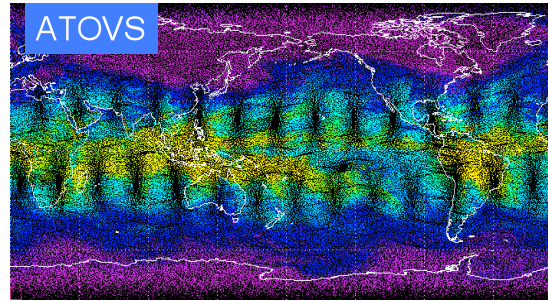
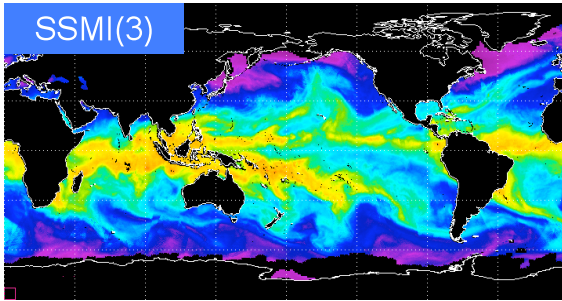
# The NVAP Global Water Vapor Climate Data Record: Plans for Improvement and Extension from 1987-2010

**John Forsythe**

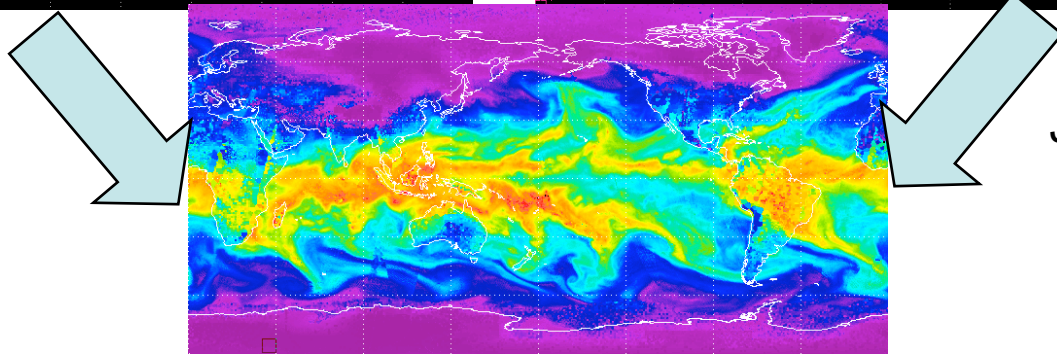
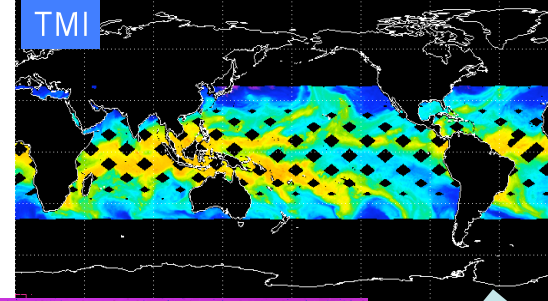
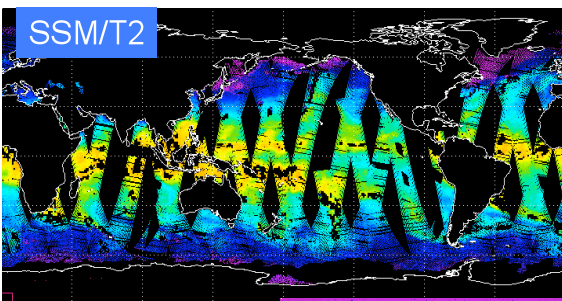
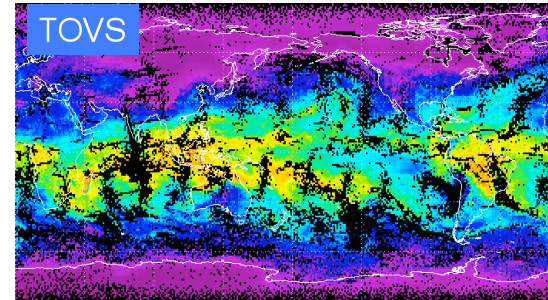
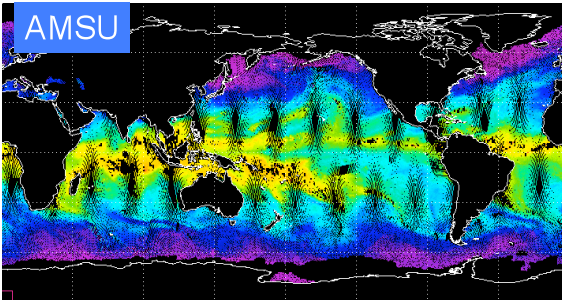
**Tom Vonder Haar**

**CIRA, Colorado State University**





NVAP =  
NASA Water  
Vapor  
Project Data  
Set.



Jan. 1, 2000.  
Example of inputs  
for Total  
Precipitable Water.



Atmospheric Sounding Science Team Meeting October 14-17, 2008



## SYNOPSIS OF NVAP (1988 – 1999)

- Global 1 degree grid
- Daily
- Total Precipitable Water
- Cloud Liquid Water
- 4 layers of water vapor
- Inputs SSM/I, TOVS, rawinsondes

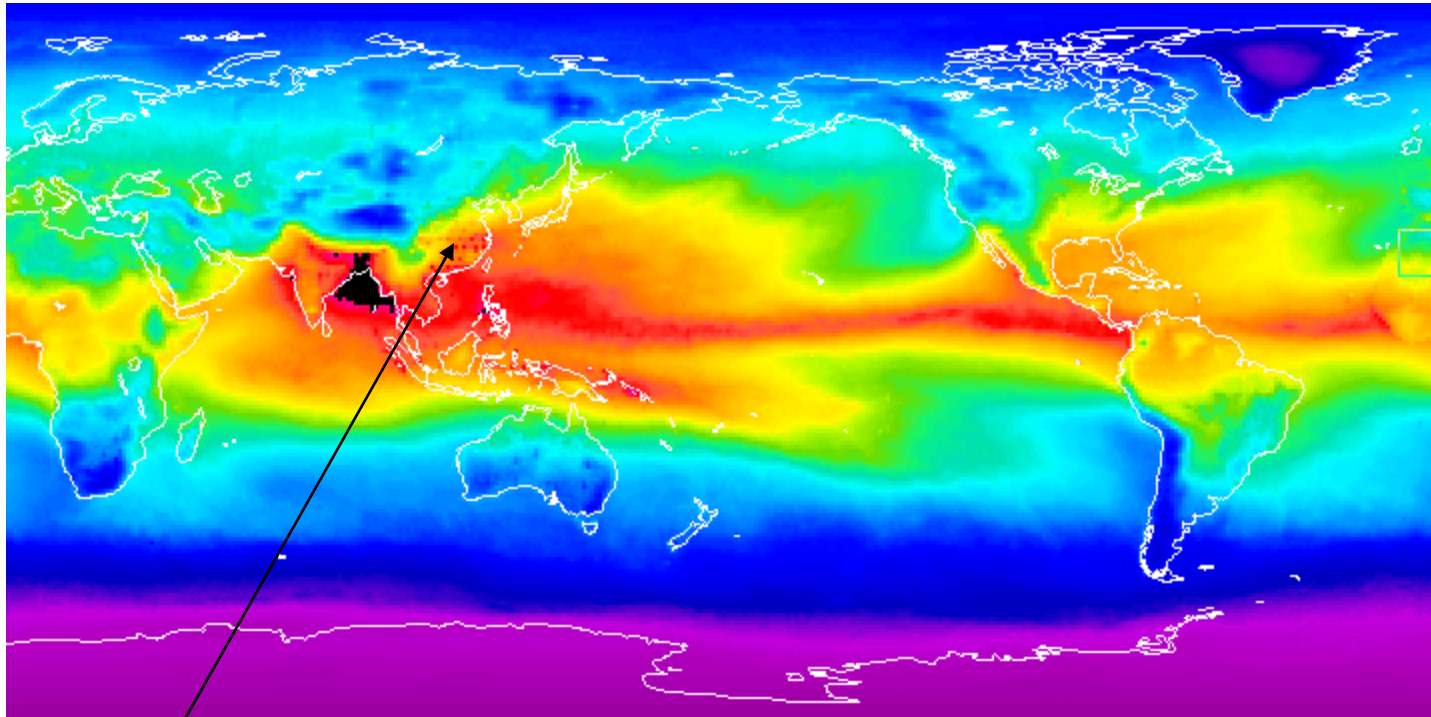
## NVAP-Next Generation (2000 and 2001)

- Global 1/2 degree grid
- Twice Daily, and Daily
- Total Precipitable Water
- Cloud liquid water
- 5 layers of water vapor
- Data source and retrieval performance flags
- Inputs from three SSM/I, NOAA Operational ATOVS, AMSU and SSM/T-2, TMI, TOVS Pathfinder Path A.

**NVAP is a multi-purpose dataset with daily global fields of moisture. It was created in four stages of NASA Pathfinder funding. It has never been reanalyzed... But a new effort under the NASA MEaSUREs program will allow for a reanalysis.**



## NVAP Weekly Mean TPW, August 20 – 26, 1988 – 1999.



0

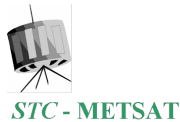
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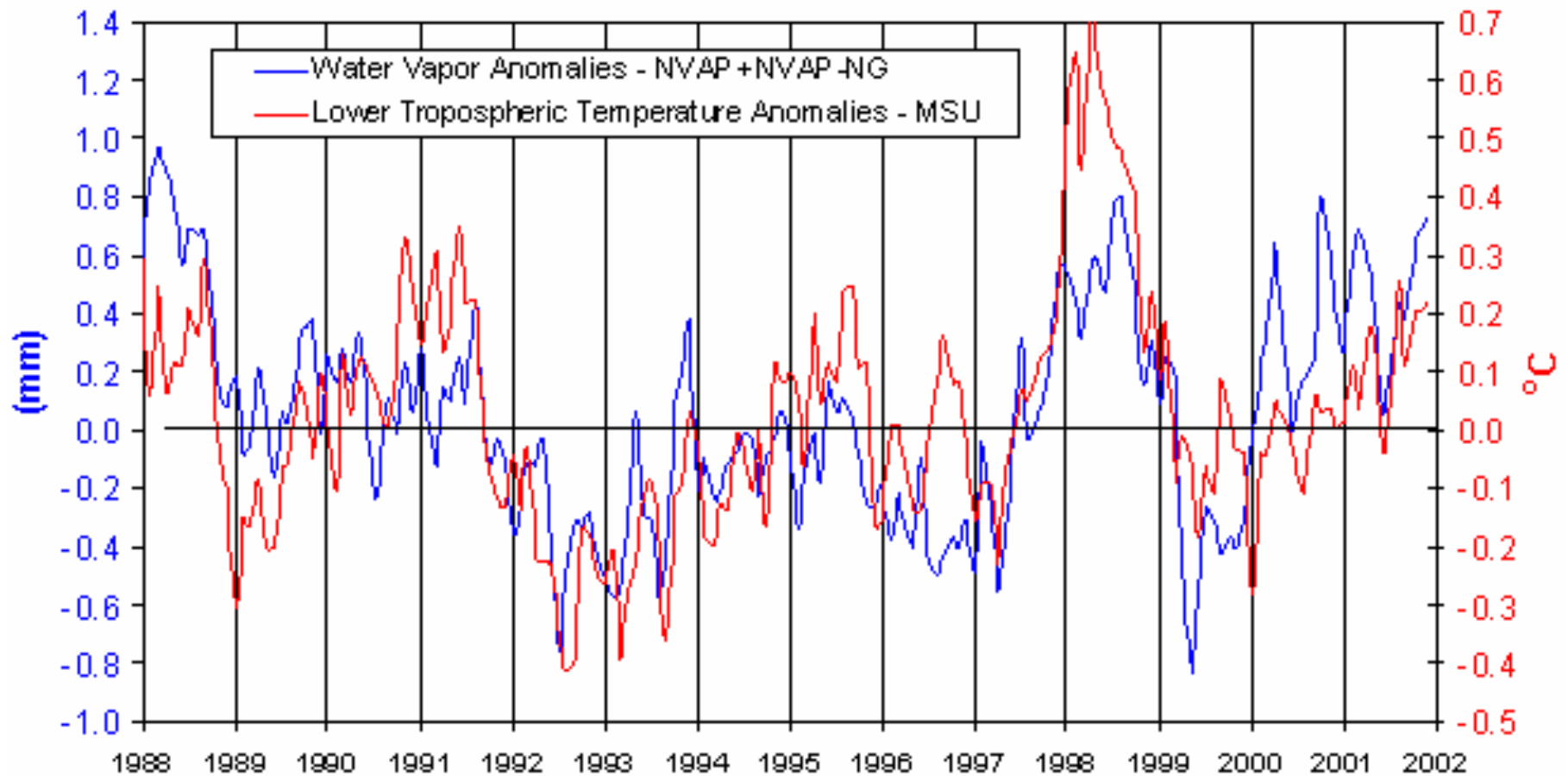
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Weekly Mean TPW (mm)

Can be used by forecasters for flood forecasting for instance...

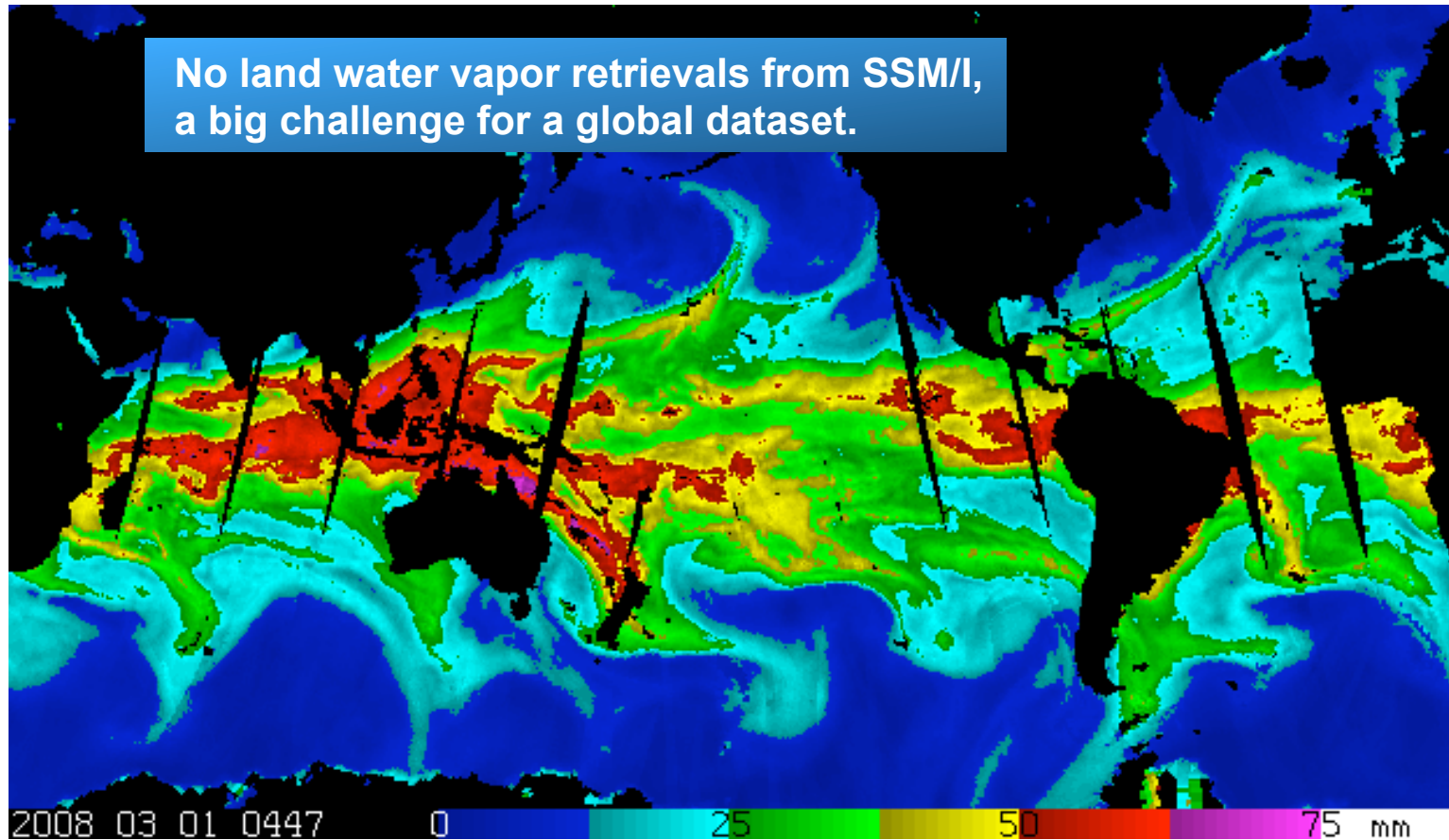
Notice artifacts of radiosondes





Anomaly fields of NVAP Global TPW and MSU Temperature of Lower Troposphere

6 satellite (up to 3 AMSU + 3 SSM/I 6-hourly global ocean TPW for forecasters)



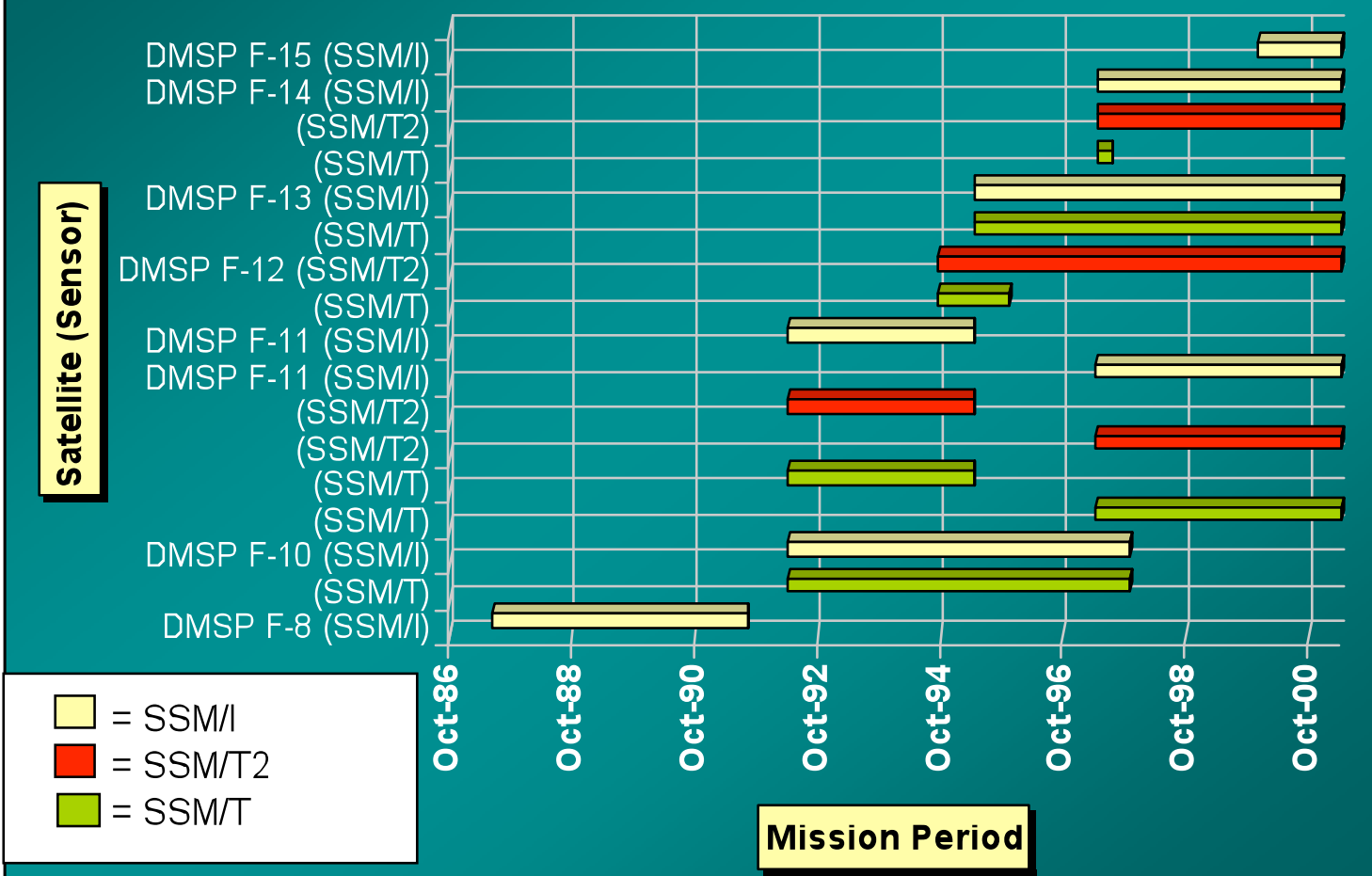
Kidder, S.Q., A. Jones, 2007: A blended satellite total precipitable water product for operational forecasting. *J. Atmos. Oceanic Technol.* **24**, 74-81.

<http://amsu.cira.colostate.edu/gpstpw>

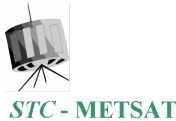
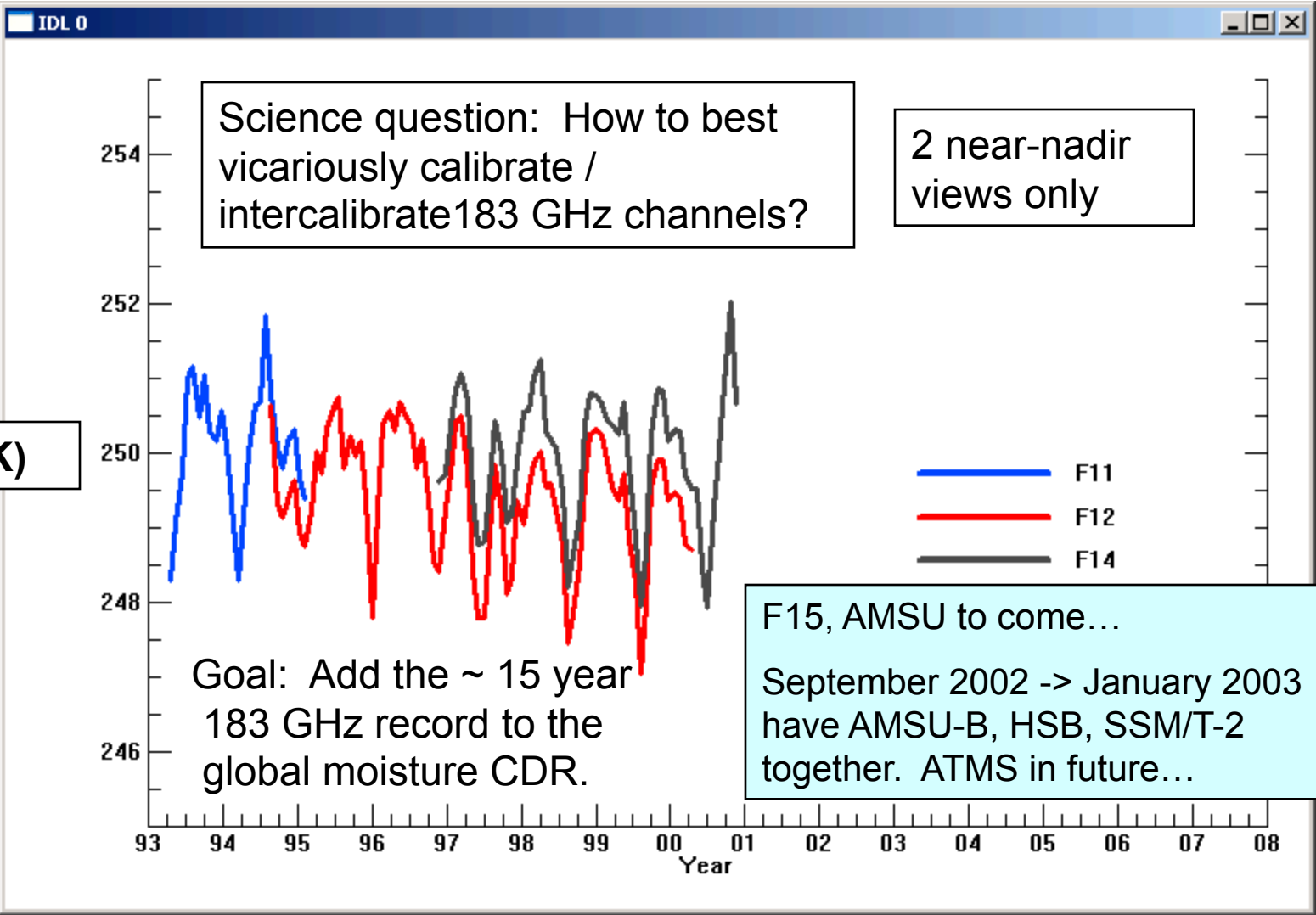
<http://amsu.cira.colostate.edu>



# DMSP Passive Microwave Sensors Through 2000



Monthly mean SSM/T-2 183 +/-1 GHz Tropical  $T_A$  (10N – 10 S)





Goal: Improve upon existing NVAP dataset to make a consistent global water vapor dataset for a variety of users.

**Three types of users require different approaches:**

- 1. Regional climate and process studies.** (“NVAP-R”). (e.g. North American Monsoon). Weather analysis. Requires consistency of days. Maximize spatial coverage, resolution.
- 2. Interannual variability.** (“NVAP-I”). Requires consistency of years.
- 3. Trends on multidecadal scales.** (“NVAP-T”). Requires consistency of decades.

These uses place different demands on the water vapor products (maximizing spatial and temporal coverage, minimizing intersensor differences...)

*Historically, NVAP has used a “one size fits all” approach. Current thinking with NVAP-MEaSURES is to create 3 related datasets tailored towards each user group.*

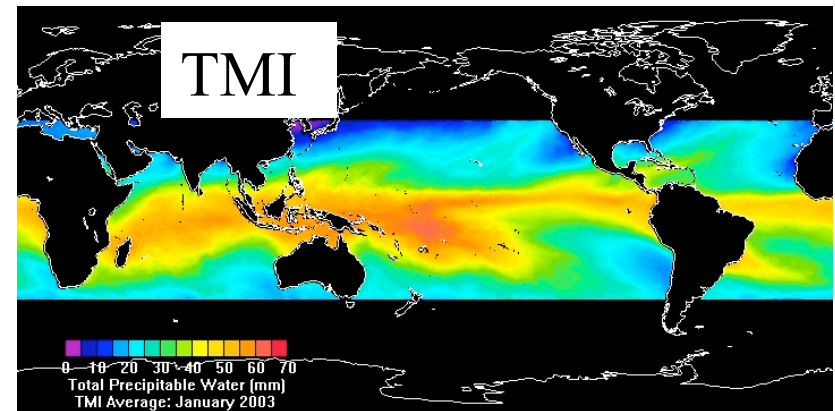
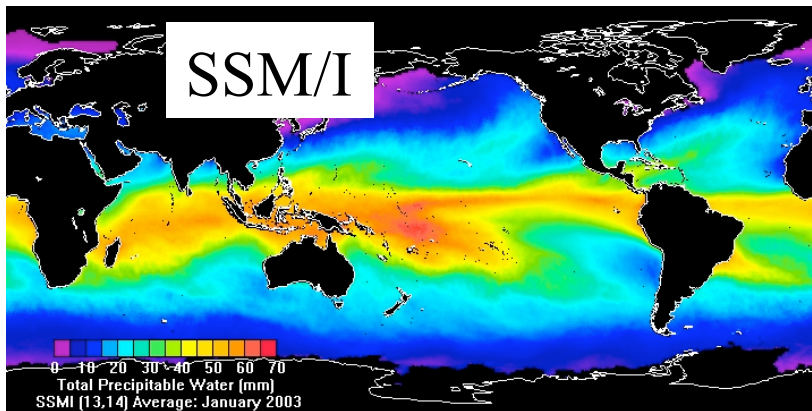
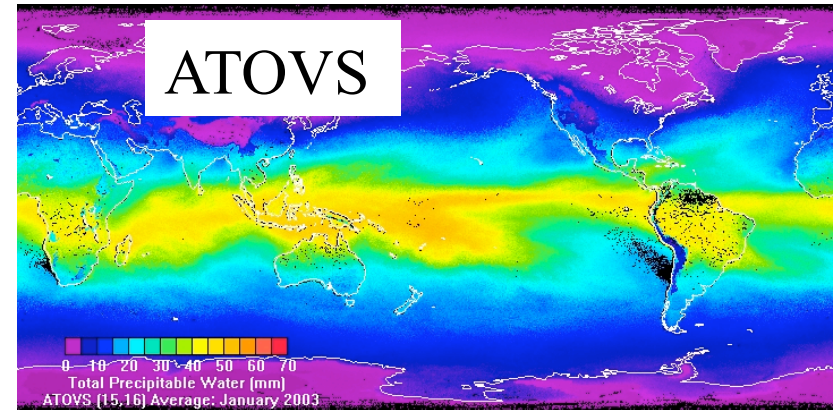
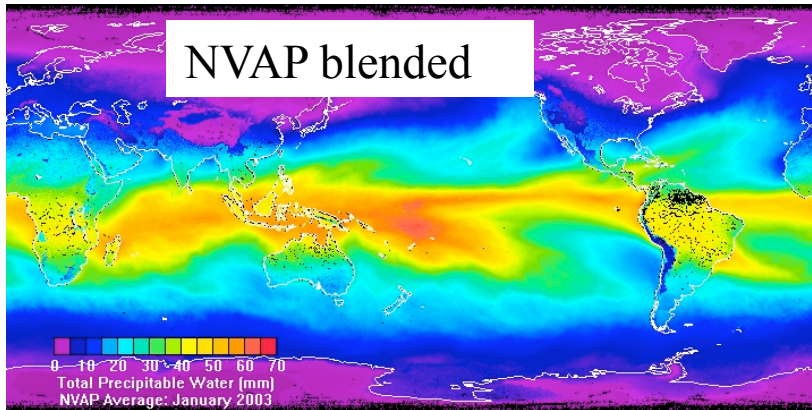
## Major NVAP Time-Dependent Biases (1988 – 2001)

Time Dependent Bias	Solution
<p><b>TOVS:</b></p> <p><b>1. Changes in NOAA operational TOVS algorithm through time.</b></p>	<p>Use a consistent climate-oriented retrieval such as NASA Pathfinder Path A (Susskind et al. 1997). <b>Any thoughts on other TOVS moisture products?</b></p> <p>AIRS Intercomparison</p>
<p><b>SSM/I:</b></p> <ol style="list-style-type: none"> <li>1. 22 GHz channel not used 1988-1992</li> <li>2. Precipitation and sea ice detection methods vary</li> <li>3. Need intercalibrated time series of TB's using new instrument knowledge.</li> </ol>	<p>Apply a fixed algorithm through time</p> <p>Chris Kummerow (CSU) working on SSM/I Tb time series</p>
<p><b>Radiosonde:</b></p> <ol style="list-style-type: none"> <li>1. Varying quality control methods</li> <li>2. 2000 – 2001 did not use radiosonde</li> </ol>	<p>Use climate-oriented data such as CARDS (Eskridge et al. 1999)</p>
<p><b>Miscellaneous:</b></p> <ol style="list-style-type: none"> <li>1. Topography masking causes TPW too high over high terrain (1988 – 1992)</li> <li>2. Land mask changed through time.</li> </ol>	<p>Use single high resolution (&lt; 10 km) global topography mask such as GTOPO30</p>

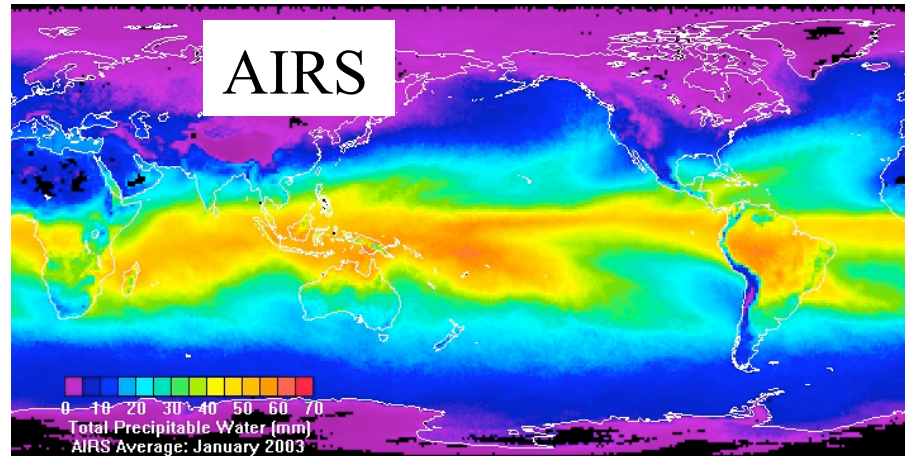


STC - METSAT

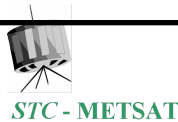
# Total Precipitable Water



January 2003  
comparison to  
AIRS of SSM/I,  
TMI and NOAA  
operational  
ATOVS.



More in-depth  
comparisons to  
AIRS  
forthcoming  
with the JPL  
group of Fetzer  
et al.



## Summary

- A reanalysis and extension of the NASA NVAP global water vapor dataset from 1987-2010 has begun under the NASA MEaSUREs program.
- Collaboration in progress with JPL AIRS group to study scene dependent AIRS biases, compare other NVAP inputs to AIRS, and incorporate AIRS products into NVAP.
- We are currently researching CDR-quality total column and water vapor profile data sets from 1987 – present.
- Plan increased role of 183 GHz data for atmospheric moisture.
- Pre-Aqua satellite moisture products remain a challenge.