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

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Example of inputs for Total Precipitable Water.

NVAP = NASA Water Vapor Project Data Set.


• 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 SSMI 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.

Notice artifacts of radiosondes

Can be used by forecasters for flood forecasting for instance…
Anomaly fields of NVAP Global TPW and MSU Temperature of Lower Troposphere

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

http://amsu.cira.colostate.edu
Monthly mean SSM/T-2 183 +/-1 GHz Tropical $T_A$ (10N – 10 S)

Science question: How to best vicariously calibrate / intercalibrate 183 GHz channels?

Goal: Add the ~ 15 year 183 GHz record to the global moisture CDR.

F15, AMSU to come...

September 2002 -> January 2003 have AMSU-B, HSB, SSM/T-2 together. ATMS in future…

2 near-nadir views only
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)

<table>
<thead>
<tr>
<th>Time Dependent Bias</th>
<th>Solution</th>
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<tbody>
<tr>
<td><strong>TOVS:</strong>&lt;br&gt;1. Changes in NOAA operational TOVS algorithm through time.</td>
<td>Use a consistent climate-oriented retrieval such as NASA Pathfinder Path A (Susskind et al. 1997). <strong>Any thoughts on other TOVS moisture products?</strong> AIRS Intercomparison</td>
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<tr>
<td><strong>SSM/I:</strong>&lt;br&gt;1. 22 GHz channel not used 1988-1992&lt;br&gt;2. Precipitation and sea ice detection methods vary&lt;br&gt;3. Need intercalibrated time series of TB’s using new instrument knowledge.</td>
<td>Apply a fixed algorithm through time&lt;br&gt;Chris Kummerow (CSU) working on SSM/I Tb time series</td>
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<tr>
<td><strong>Radiosonde:</strong>&lt;br&gt;1. Varying quality control methods&lt;br&gt;2. 2000 – 2001 did not use radiosonde</td>
<td>Use climate-oriented data such as CARDS (Eskridge et al. 1999)</td>
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<tr>
<td><strong>Miscellaneous:</strong>&lt;br&gt;1. Topography masking causes TPW too high over high terrain (1988 – 1992)&lt;br&gt;2. Land mask changed through time.</td>
<td>Use single high resolution (&lt; 10 km) global topography mask such as GTOPO30</td>
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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.