

Observed Global and Regional Variation in Earth's Water Vapor: Focus on the Weather-climate Interface

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The principal greenhouse gas water vapor variations are a key factor in any climate change. Their role in both the Earth's energy budget and water cycle is not well known. A new, observational dataset is now available for many science studies.

The NASA Making Earth Science Data Records for Research Environments (MEaSUREs) program supported the 4-year development and public release of the National Aeronautics & Space Administration (NASA) Water Vapor Project (NVAP-M) dataset. The dataset was released to the science community in 2013 via the NASA Langley Atmospheric Science Data Center. NVAP-M is a robust global (land and ocean) water vapor dataset created by merging multiple satellite and surface sources of atmospheric water vapor to form global gridded fields of total and layered precipitable water vapor. NVAP-M spans 22 years (1988-2009) of data, over 8000 daily fields.

NVAP-M is available globally at either daily, 1 degree or 6-hourly, or ½ degree resolution. It is observationally driven, with minimal dependence on numerical model fields, making it useful for comparison to models. Different processing paths are available with a global climate, an ocean-only and a weather event focus.

In this paper, we will present new science results from NVAP-M, including studies of extreme events, water vapor transport in data-sparse regions and trends in total precipitable water vapor. We will demonstrate a new approach for understanding sampling effects on long-term climate records developed from satellite observations. Special emphasis will be given to time-dependent sampling changes with respect to land / ocean and clear / cloudy regions. Biases in sampling can lead to misleading trends and spurious regional variations. The challenges – both from an observing system and data fusion standpoint - in creating a consistent, multi-decadal climate record of water vapor will be discussed .

NVAP-M Climate Daily Average TPW 10 September, 2004

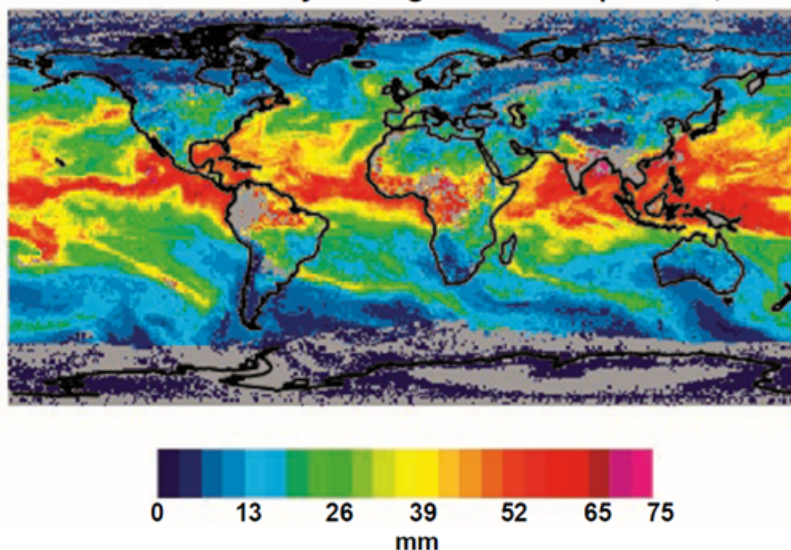


Figure 1. NVAP-M Climate daily average total precipitable water (mm) for September 10, 2004.