W-23

NESDIS Operational Blended TPW Products System

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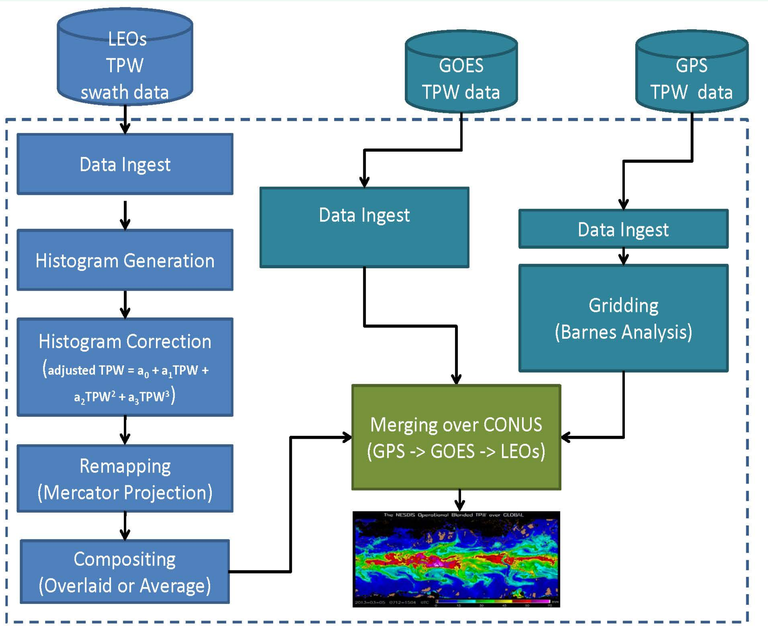
http://www.ospo.noaa.gov/bTPW

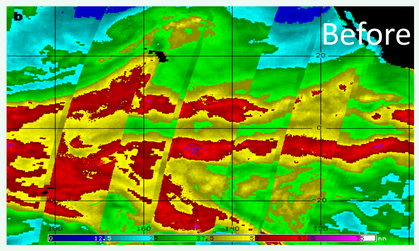
Objectives

- Provides a unified, meteorologically significant moisture field for satellite analysts and weather forecasters.
- Provides a seamless Total Precipitable Water (TPW) global map to allow the analysis of moisture transfer between land and ocean

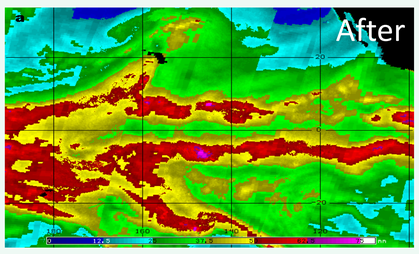
Methodology



The Blended TPW Algorithm Framework



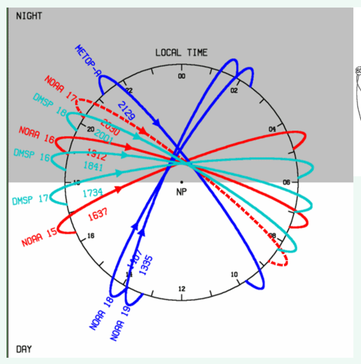
Without the bias correction, significant artifacts, resulted from different sensors/algorithms, are observed



After the bias correction is applied, the artifacts are largely eliminated, which leaves the forecaster free to concentrate on the meteorology of the situation

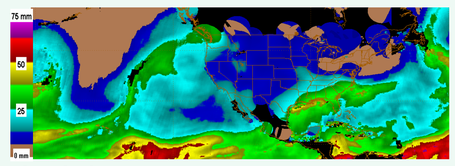
- **Histogram** – A histogram of TPW is constructed for each satellite orbit at every scan position for a five-day period, and its cumulative probability distribution function (PDF) is also calculated
- **Correction** – The cumulative PDF of each orbit is then adjusted to a chosen reference PDF at each scan position to eliminates the bias of retrievals from various sensors/retrieval algorithms,
- **Remapping** – The orbital data is further mapped on a Mercator projection after being corrected with the histogram matching method.
- **Composite** – All mapped orbits from last 12 hours are composited with the overlay method, which is favored by forecasters since it can provide the most up-to-date image possible.
- **Merging** – Over CONUS, the GPS-MET data are selected preferentially over the TPW from GOES and Polar satellites, the GOES TPW is then chosen over polar satellites under clear sky condition where the GPS-MET data are not available.

Data Sources



- **Ocean** – TPW from NOAA-15, -16, -17, -18, -19 and Metop-A, DMSP F16 and F18
- **Land** – TPW from NOAA-18, -19 and Metop-A over global land, and GOES-West & East and GPS-Met over CONUS
- **Upcoming**: Metop-B, S-NPP, Megha-Tropiques, GCOM-W1
- **Looking Forward**: GPM, GOES-R, JPSS-1, etc.

Products

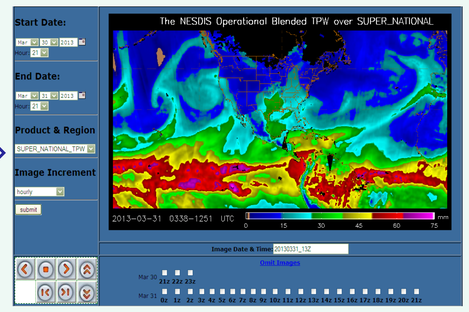


Blended TPW – Merges TPW from AMSU, SSMIS, GOES and GPS-MET into a unified resource to provide forecasters no-gap TPW coverage over globe and serves as a very helpful tool for forecasters to identify conditions that could result in heavy precipitation and subsequent flooding.

Percent of Normal TPW - Compares the blended TPW with the NVAP (NASA Water Vapor Project) weekly mean. It helps forecasters quickly see areas where active weather is occurring and assess the severity of the situation. For instance, the "Yellow" areas indicate TPW > 200% of the weekly mean, and are threat areas

- **Products** – Blended TPW and Percentage of TPW Normal (PCT)
- **Refresh** – Hourly with the latest 12 hour data from multi-satellites/sensors
- **Map Projection** – Mercator
- **Coverage** – Global Ocean and Land excluding poles (71°N to 71°S)
- **Resolution** – 16 km at equator
- **Format:** HDF-EOS, McIDAS and AWIPS

- **Animation** – Near-real time loops of blended TPW and PCT available at: http://www.ospo.noaa.gov/bTPW
- **Regions** – 15 area of interest regions for zooming in details
- **Image Interval** – 1 hour, 3, 6, 12 and 24 hours
- **Historical Data** – up to three months



Data Access

- **Real-Time Data Access to ESPC DDS through Data Access Request (DAR)** http://www.ospo.noaa.gov/Organization/About/access.html
- **Internet** – http://www.ospo.noaa.gov/bTPW
- **AWIPS** – PR, AK, HW and SN regions
- **Point of Contact** – Limin.Zhao@noaa.gov

Applications

Blended TPW over east CONUS *TPW Percentage of Normal*

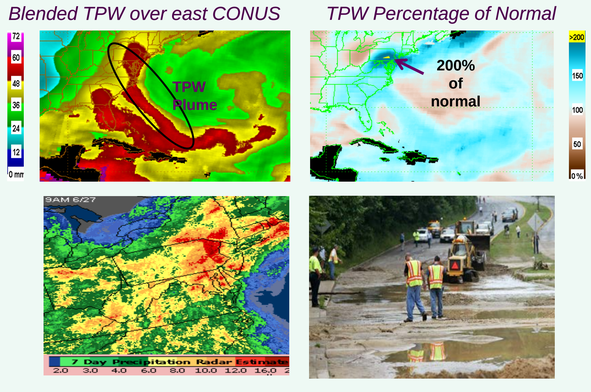


Figure 1 - *Heavy rainfall observed in Montgomery County, MD (Washington, D.C. suburbs): 217 mm for the 24h through AM on June 26, 2007; 296 mm for the 48h through AM on June 27; 323 mm for the 84h through AM on June 28.*

The blended TPW product provides a unified TPW with near-global coverage. It has been used, together with the percentage of TPW normal, by satellite analysts and forecasters to improve analysis and prediction of heavy precipitation and flash flood, and also monitoring the "atmospheric rivers" (ARs). Shown here are a couple of examples.

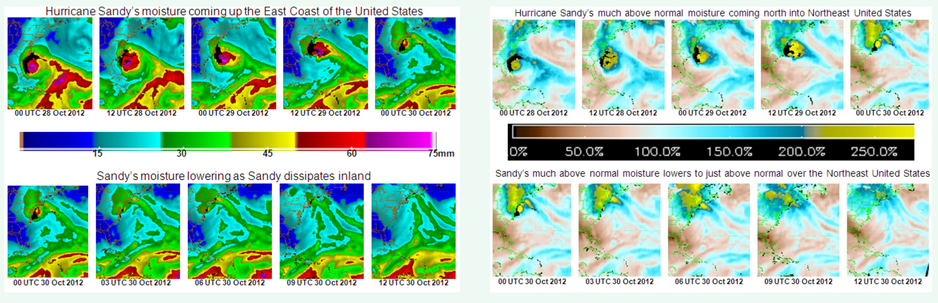


Figure 2 - *Images show how the moisture transfers as Hurricane Sandy moved toward inland.*

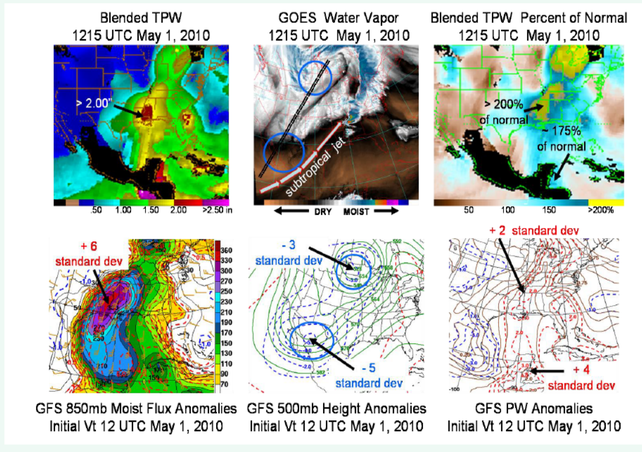


Figure 3 - *The individual satellite products/imagery (top row) complement and supplement the particular GFS initial analysis standardized anomalies (bottom row) for 1200 UTC May 1, 2010: Blended TPW (top left) and model 850mb moisture flux anomalies (bottom left); Analyzed GOES 6.7μ Water Vapor image (top middle) and model 500mb height anomalies (bottom middle); Blended TPW Percent of Normal (top right) and model precipitable water anomalies (bottom right).*

Acknowledgements – During the TPW products transition from research to operation, the following colleagues have also made good contributions and their efforts are appreciated: *Peter Keehn, John Paquette, Jianbin Yang, Jerry Guo, Aiwu Li, Ingrid Guch and Tom Schott*