

GPS Boundary-Layer Observations in Support of Aviation Weather Products

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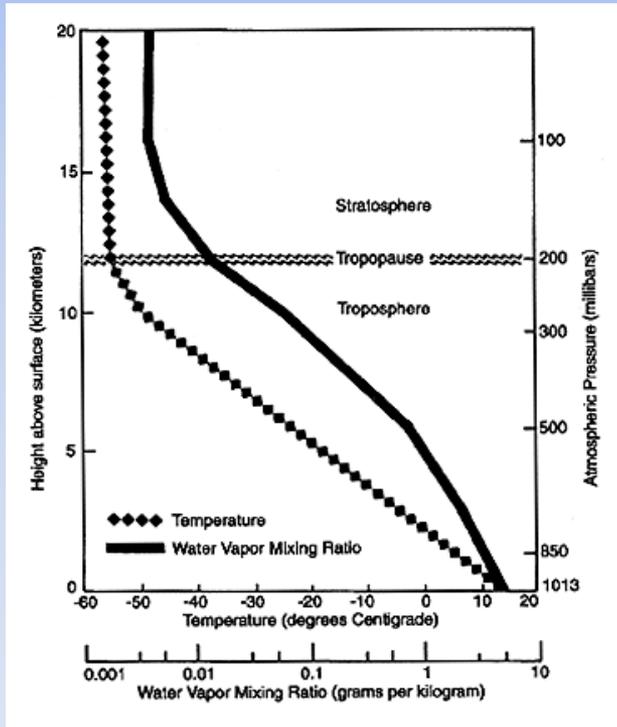
Role of GPS in NextGen

- From the perspective of FAA, GPS is primarily used for positioning, navigation and timing (PNT).
- NOAA also uses GPS to monitor the refractivity of the upper and lower atmosphere with applications in space and conventional weather forecasting and climate monitoring.
- GPS observations are assimilated hourly into NWP models such as RUC and RR that are used in aviation weather forecasting.
- GPS contributes to improved RUC/RR short-term forecast accuracy below ~ 7 km.



Low-Level Moisture Observations

- Since most of the moisture in the atmosphere is concentrated in the Planetary Boundary Layer, GPS measurements are very sensitive to the conditions associated with many severe weather events impacting aviation weather.



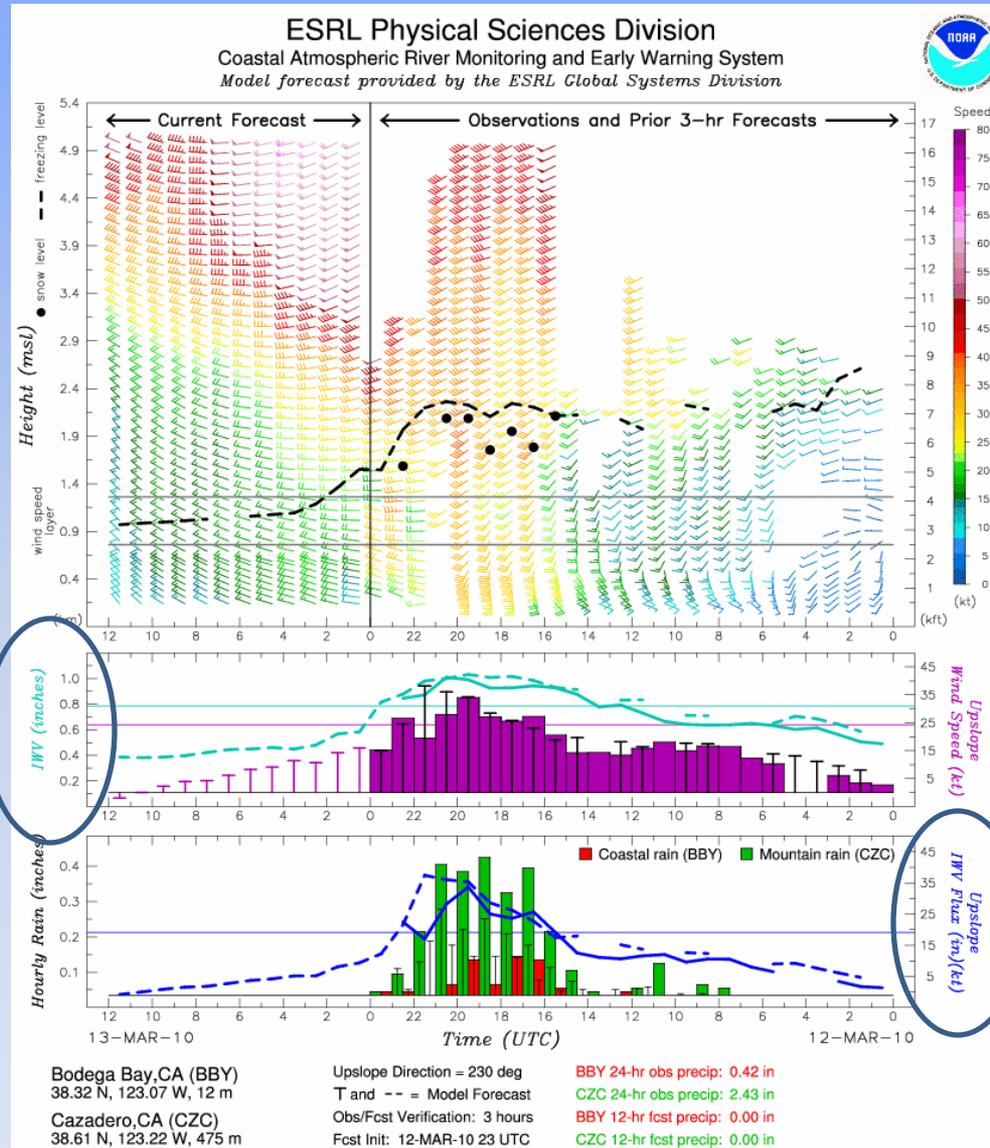
- Recent work carried out in collaboration with ESRL's Physical Sciences Division has advanced our understanding of moisture transport and improved our ability to monitor and predict severe weather and heavy precipitation.

Water Vapor in Climate System Special Report, AGU (1995)

OAR/ESRL/GSD/Forecast Applications Branch



Low-Level Moisture Flux Estimates



Controlling layer

GPS TPW is a proxy for LL moisture

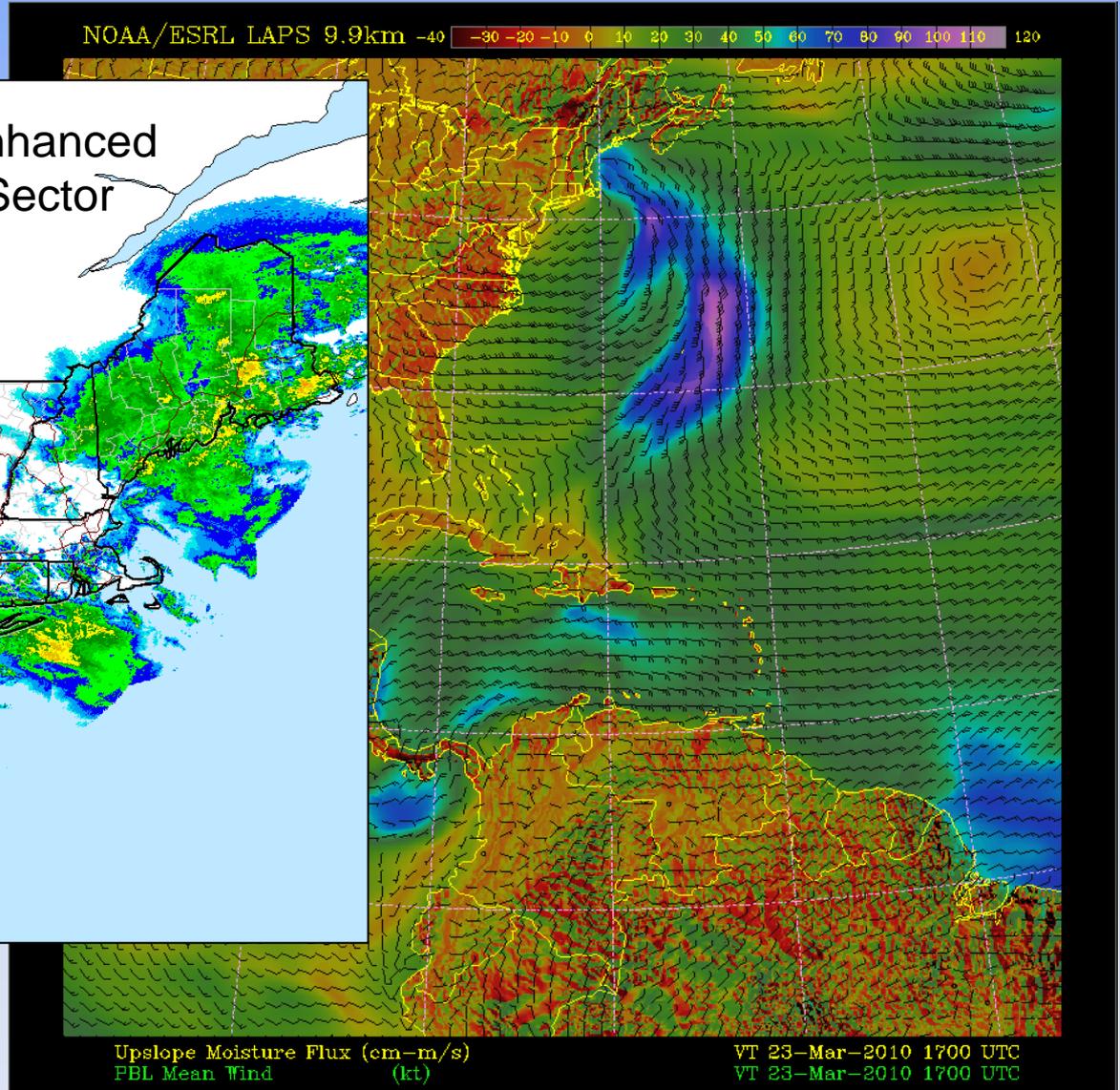
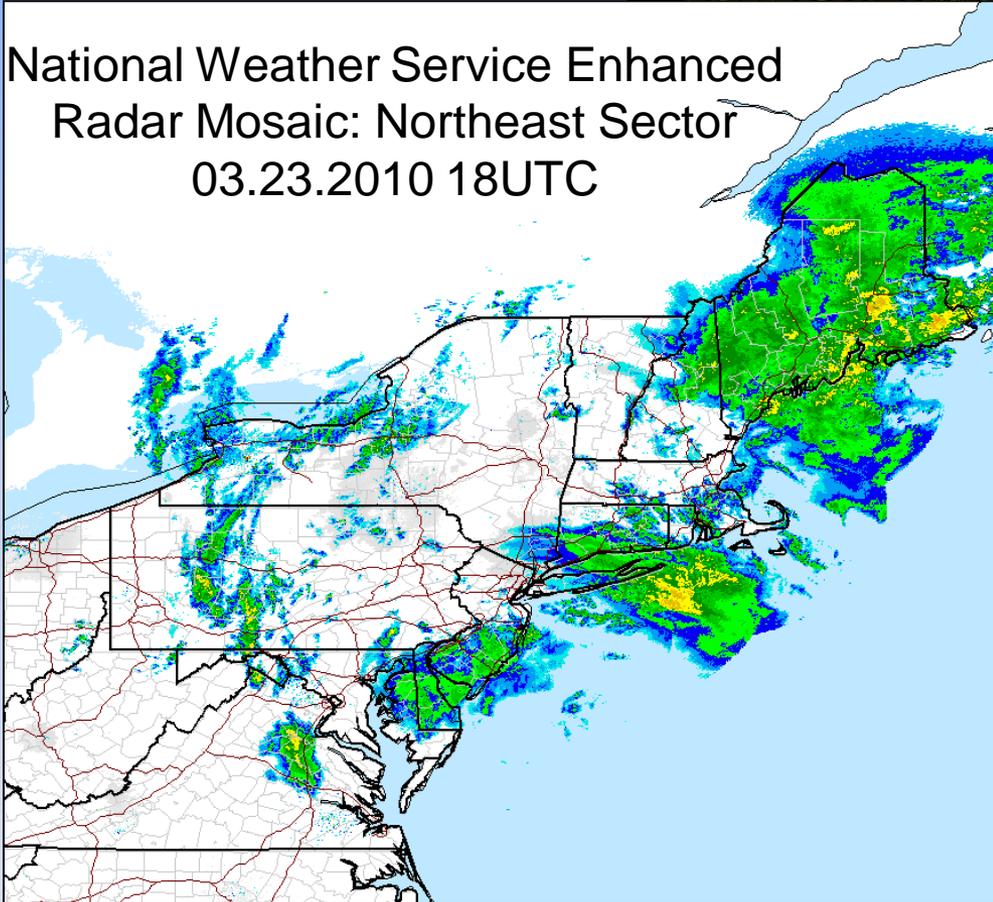
$$UMF \approx \bar{\rho} \bar{q} U$$



NRT LAPS Moisture Flux Estimates

NOAA/ESRL LAPS 9.9km -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120

National Weather Service Enhanced
Radar Mosaic: Northeast Sector
03.23.2010 18UTC



Upslope Moisture Flux (cm-m/s)
PBL Mean Wind (kt)

VT 23-Mar-2010 1700 UTC
VT 23-Mar-2010 1700 UTC

