

GPS METEOROLOGY

ET – RS UAT&T

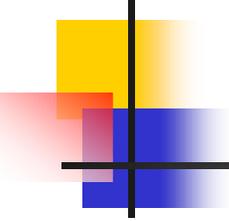
14-17 MARCH, 2005

GENEVA, SWITZERLAND

Rainer Dombrowsky, NOAA/NWS

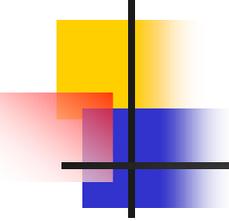
Prepared with the assistance of Seth Gutman

NOAA Forecast Systems Laboratory



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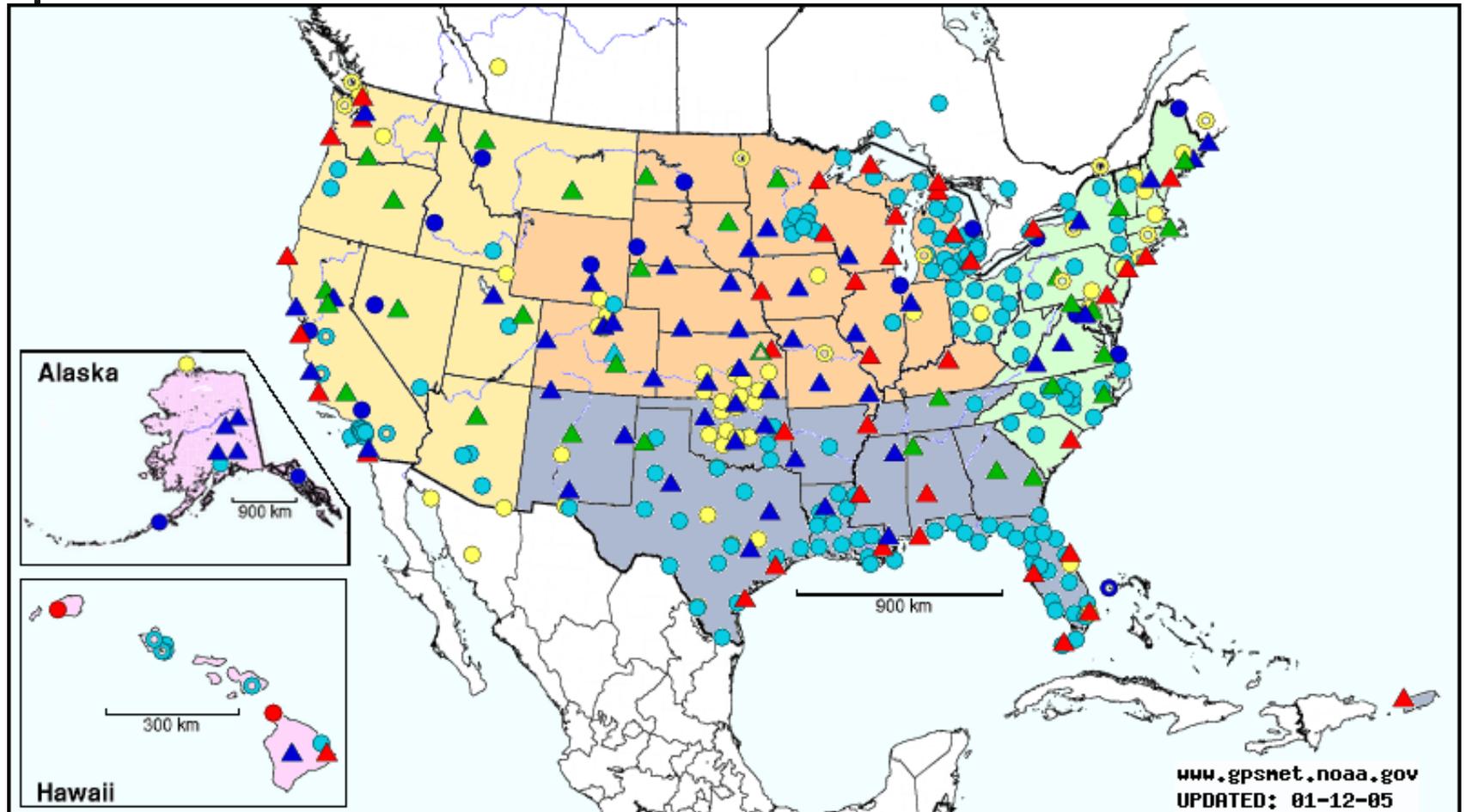
- **RADIOSONDES HAVE PROVIDED THE STANDARD FOR UPPER-ATMOSPHERIC DATA SET FOR NUMERICAL WEATHER PREDICTION.**
- **RADIOSONDES STILL FORM THE BASIS OF INTER-COMPARISON, CALIBRATION AND VALIDATION OF MOST ATMOSPHERIC OBSERVING SYSTEMS.**
- **RADIOSONDES SERVE AS THE BENCHMARK FOR SATELLITE DERIVED ESTIMATES OF MOISTURE AND TEMPERATURE.**

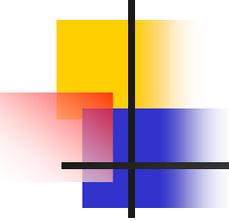


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- THE MAJORITY OF IPW DATA CONTINUES TO COME FROM RADIOSONDES
- A LARGE NUMBER OF SURFACE MEASUREMENTS OF DEW POINT ARE MADE HOURLY AT LAND SITES, BUT PROVIDE LITTLE INFORMATION ABOUT MOISTURE ABOVE SURFACE
- SATELLITE DATA HAS ITS LIMITATIONS. DATA HAVE HIGH HORIZONTAL RESOLUTION BUT COARSE VERTICAL RESOLUTION
- ON-BOARD WATER VAPOR SENSING SYSTEMS ARE USED TO FURTHER COMPLIMENT THE A NOAA/NWS INTREGRATED APPROACH TO ATMOSPHERIC MONITORING

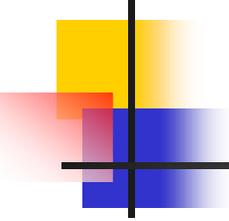
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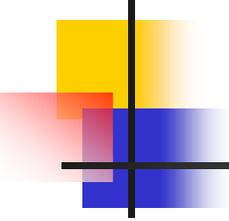
Integrated precipitable water vapor is now routinely retrieved in near real-time from data acquired at more than 300 GPS sites in North America.



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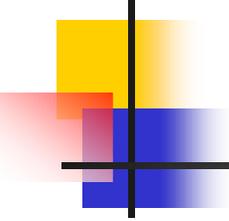
■ USES OF GPS OBSERVATIONS

- USED TO COMPLIMENT THE RADIOSONDE NETWORK
- USED TO EVALUATE THE ACCURACY OF RADIOSONDE MOISTURE OBSERVATIONS
- COMPARE USE AND NON-USE OF GPS DATA AND THEIR IMPACT ON WEATHER FORECASTS
- GPS DATA, ALTHOUGH COMPLIMENTARY, IS USED AS A PROXY FOR MOISTURE SOUNDING IN NUMERICAL WEATHER PREDICTION MODELS



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- **SINCE 1994 EVALUATIONS OF GPS UTILITY HAVE BEEN CONDUCTED; THESE INCLUDE:**
 - **OPERATIONAL WEATHER FORECASTING**
 - **CLIMATE MONITORING**
 - **ATMOSPHERIC RESEARCH**
 - **SATELLITE CALIBRATION AND VALIDATION**

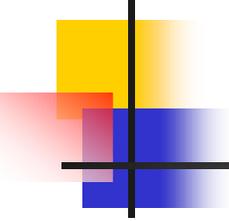


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- **NEXT STEP:**

Establish an Integrated Upper-Air Observing System

- Will provide data at asynoptic times.
- More reliable than IR satellite alone.
- GPS-Met accuracy sufficient to compliment operational RAOB soundings.
- Fills gaps in RRS network



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■ CONCLUSIONS

- **GPS WATER VAPOR MEASUREMENTS CAN BE MADE WITH HIGH RELIABILITY UNDER ALL WEATHER CONDITIONS**
- **RETRIEVAL ACCURACIES HAVE BEEN SHOWN TO BE COMPARABLE TO, OR BETTER THAN, INTEGRATED RAWINSONDE MEASUREMENTS WITHOUT KNOWN PROBLEMS AT HIGH HUMIDITY OR LOW TEMPERATURE**
- **GPS-IPW APPEARS TO BE A COST-EFFECTIVE OBSERVING SYSTEM AND THERE APPEAR TO BE NO TECHNICAL IMPEDIMENTS TO ITS OPERATIONAL IMPLEMENTATION**