



Directions in Precipitation Processing



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DOH/RDM Conference
June 2004

Today's Presentation

- Current problems in precipitation estimation for river forecasting
- Mitigation efforts
- Solutions in process
- Directions for the future
- Communication opportunities

Background

- Advanced hydrologic models require higher precipitation estimates with spatial and temporal higher resolution than can be achieved from gauge network
- Current operational hydrologic models will benefit from better precipitation estimates, particularly where gauge network is sparse
- The basis of the Multisensor Precipitation Analysis (MPE) package is statistical merging of rain gauge, radar, and satellite estimates
- The aim of MPE is to reduce biases and errors in radar and satellite estimates, then create optimal merge with rain gauge information

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Feedback from RFC's

- Between June 2003 and May 2004, Hydrometeorology Group and/or HSEB personnel have directly contacted personnel from all RFC's
- Meeting venues: personal visits, RFC/WFO MPE teletraining, PQPE Advisory Group
- Most concerns about MPE are well known to us:

MPE Feedback from RFC's I

RFC	Area of Concern
NERFC	Bias correction for satellite estimates
MARFC	Underestimation relative to climatic gauge network
SERFC	PRISM data for Puerto Rico; cool-season underestimation
OHRFC	Bright band, spatially-random biases, Post Analysis functions
NCRFC	Bright band, cool-season underestimation
MBRFC	Bright band, cool-season underestimation
ABRFC	Lack of P3 functionality: method of bias correction, gauge QC features

MPE Feedback from RFC's II

RFC	Area of Concern
LMRFC	Interaction speed.
WGRFC	Merging of satellite estimates with radar/gauge; bias information sharing with WFO's
CBRFC	Lack of Mountain Mapper functionality: analyses for 6-hour amounts, interaction speed. Radar/gauge data gaps
CNRFC	Lack of Mountain Mapper functionality. Radar/gauge data gaps
NWRFC	Lack of Mountain Mapper functionality. Radar/gauge data gaps
APRFC	No satellite estimates.

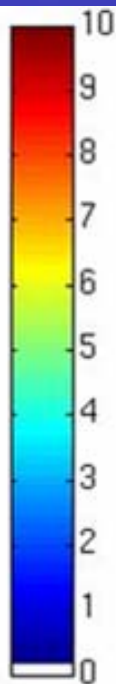
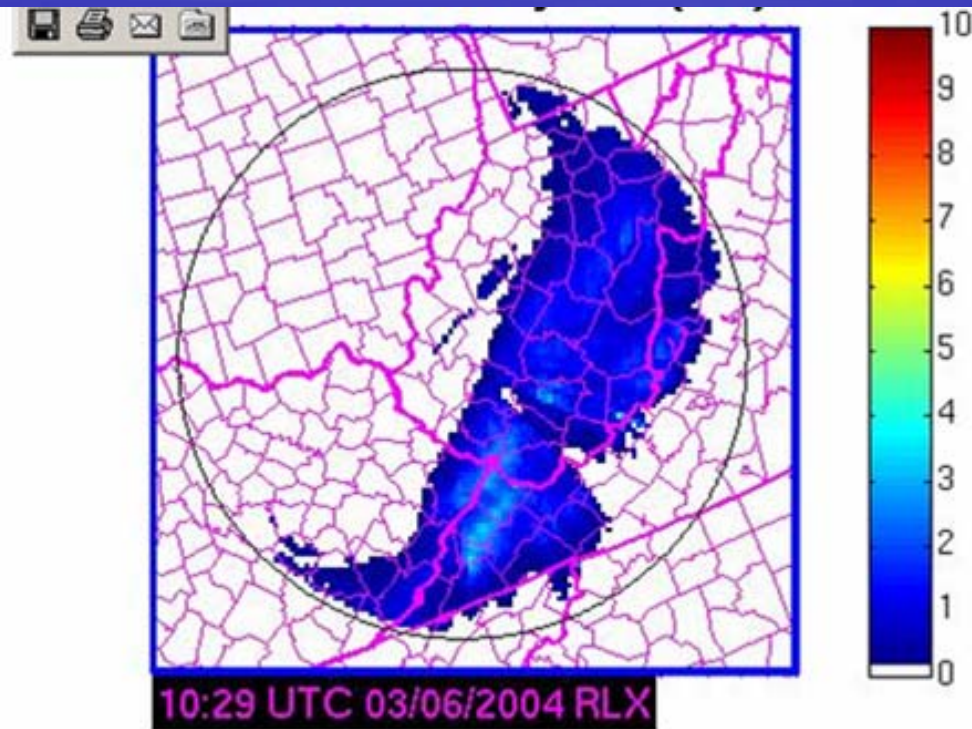
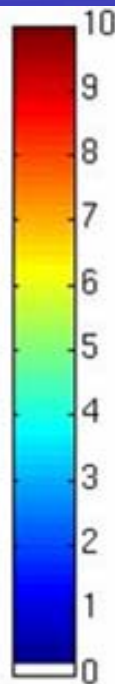
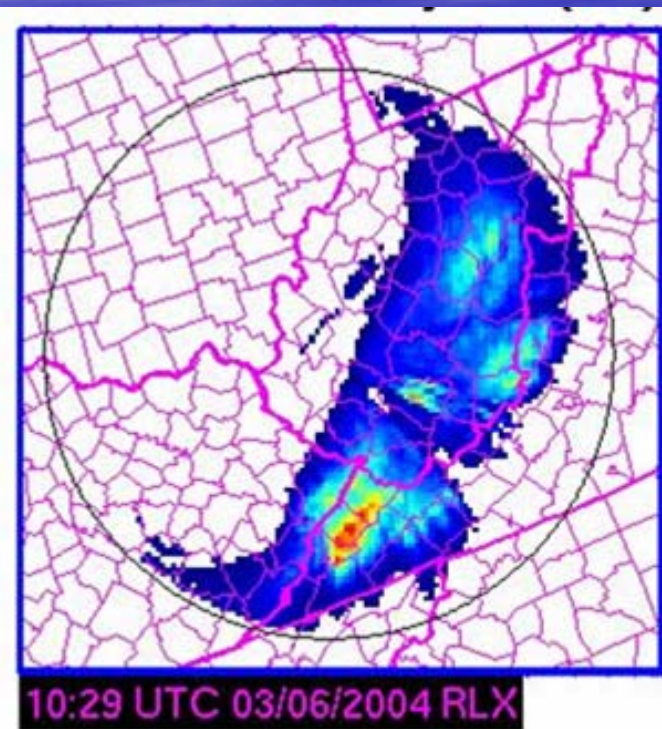
What's Being Done...

- **MPE reanalysis:**
 - Carried out for SERFC, ABRFC; upcoming for WGRFC
 - Changed some assumptions about parameter settings for minimum rainfall for gauge/radar bias
- **Satellite data integration:**
 - Bias-adjusted Hydroestimator available in OB4
 - Gauge/radar/satellite merging now being tested
- **New graphical gauge QC aides in OB3**
 - Spatial consistency check
 - Stuck gauge check

What's Being Done...

- **Range correction for radar estimates:**
 - Field test carried out for KLWX, KPBBZ, KRLX, KEAX, KMPX, KRTX
 - Results indicate bright band effects significantly mitigated
 - RPG Implementation in 2005, fielded 2006, subject to TAC approval

Range Correction Applied to 12-H Precipitation Estimate



Original estimate

With range correction

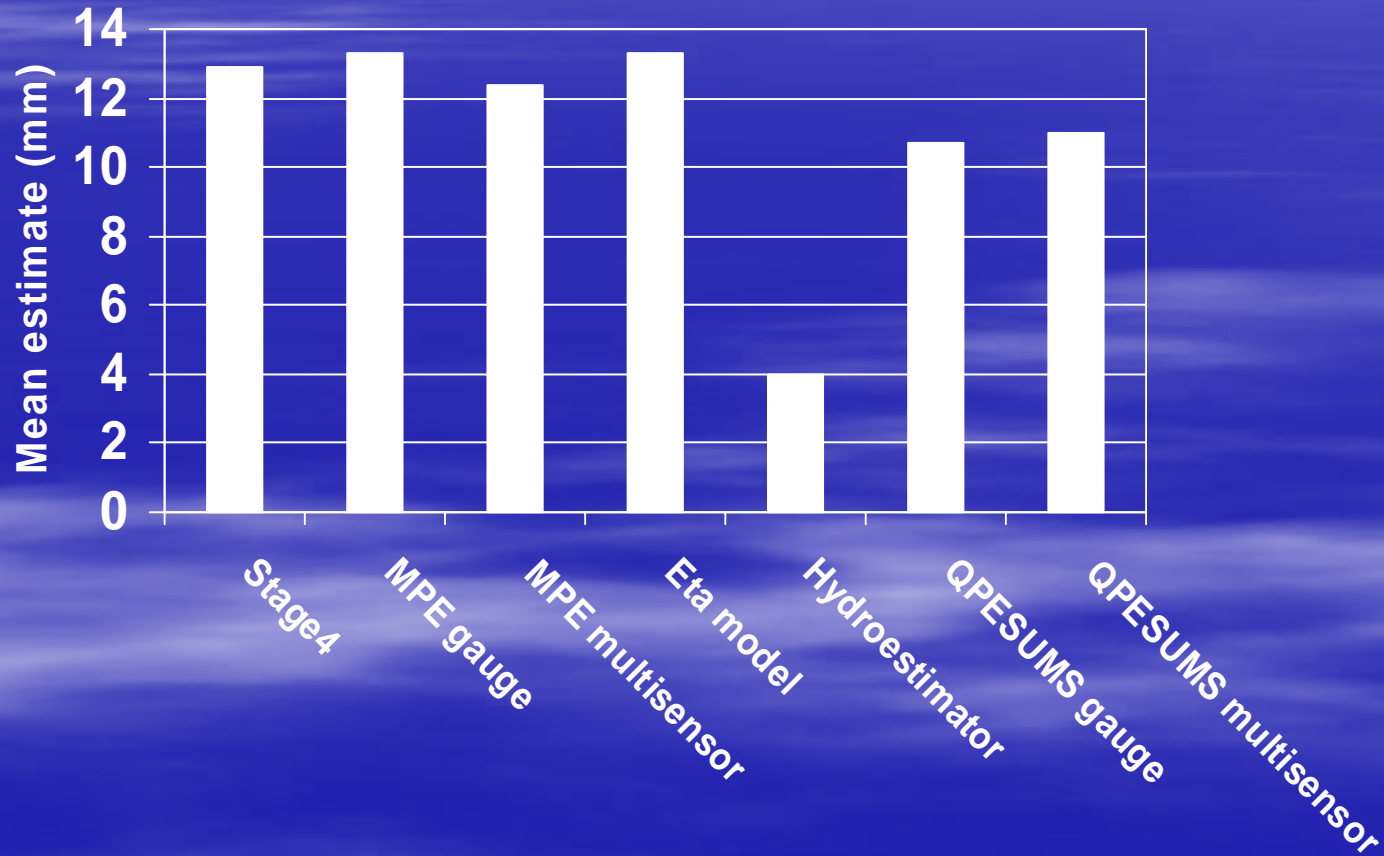
What's Being Done Long Term...

- Alternative processing of satellite data
 - Have carried out two comparisons of MPE and NSSL QPE-SUMS
 - Results inconclusive due to data problems
 - Experiment planned for Intermountain Region this year
- Testing merged gauge/radar/satellite analysis field

CNRFC Area, Nov 2002 – May 2003

24-h independent gauge amounts, mean 13.3 mm

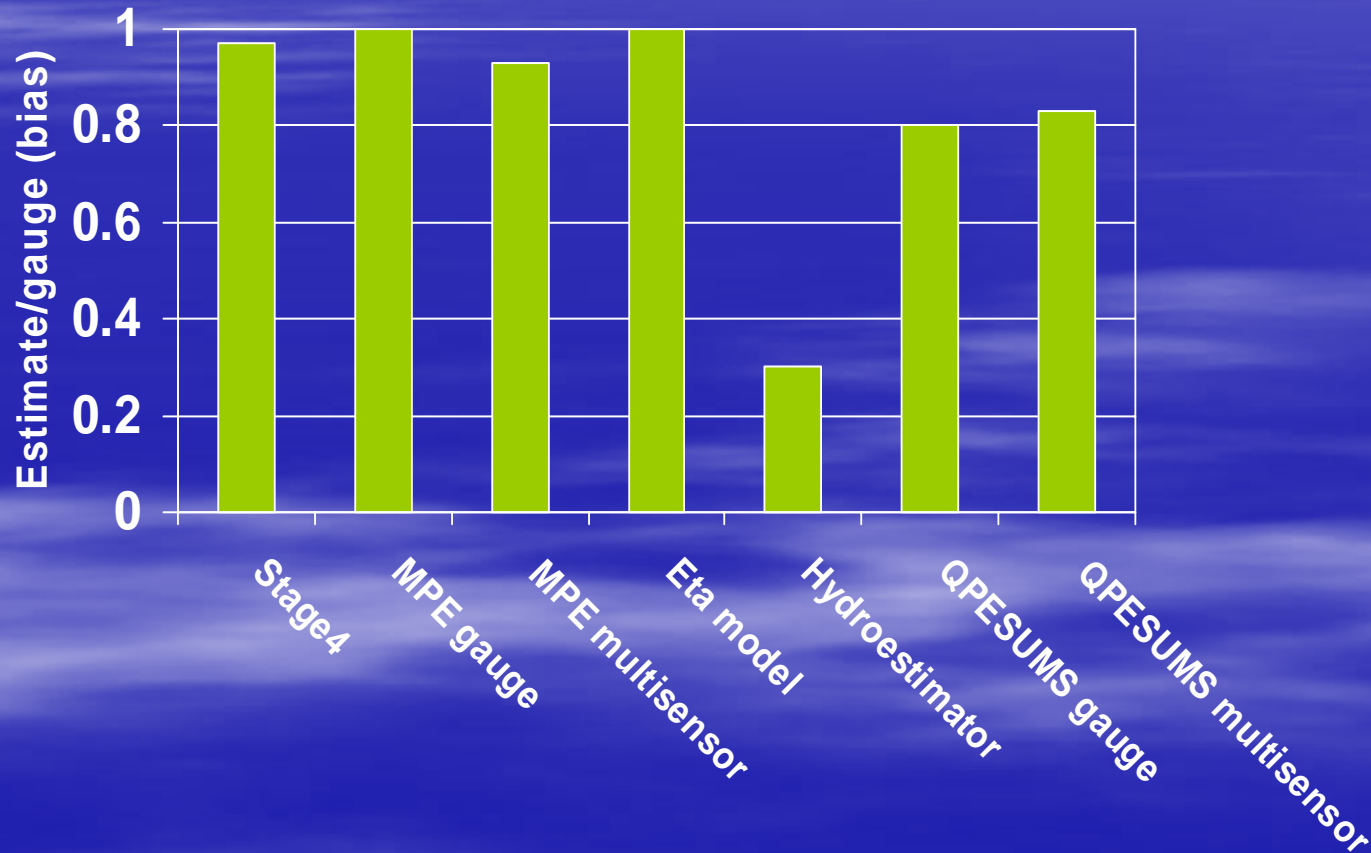
Mountain Mapper (Stage4) , MPE, QPE-SUMS, Eta, Hydroestimator



CNRFC Area, Nov 2002 – May 2003

24-h independent gauge amounts, mean 13.3 mm

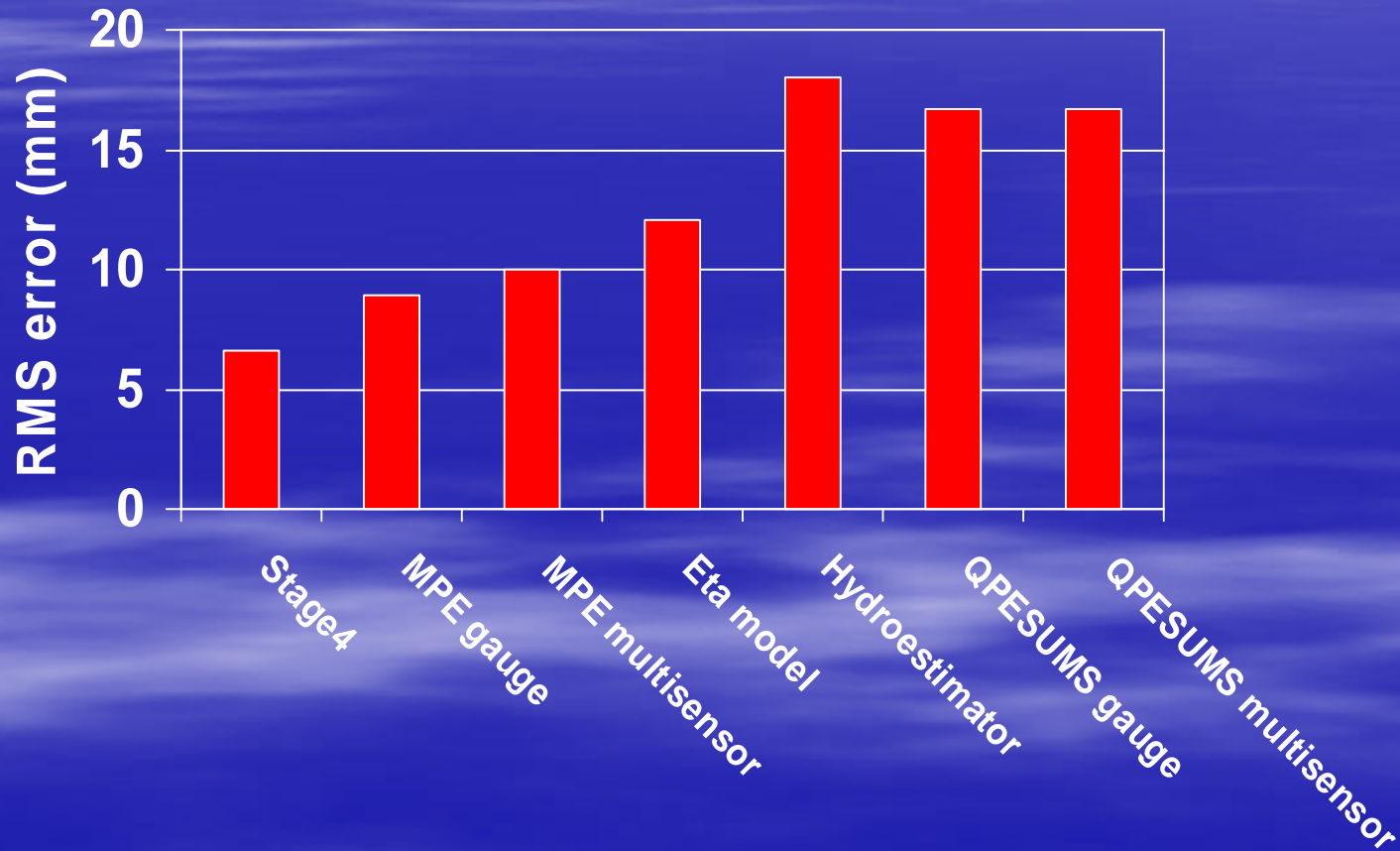
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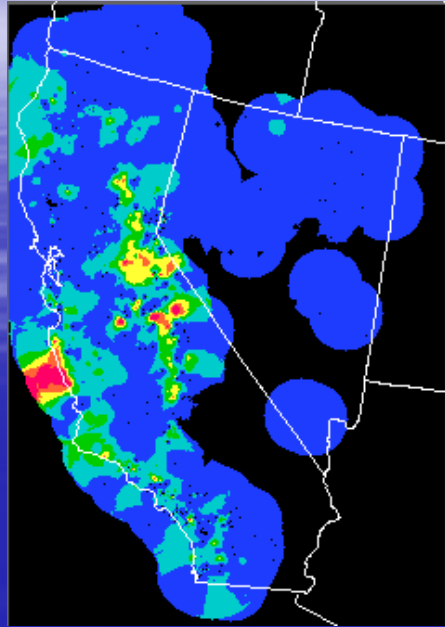
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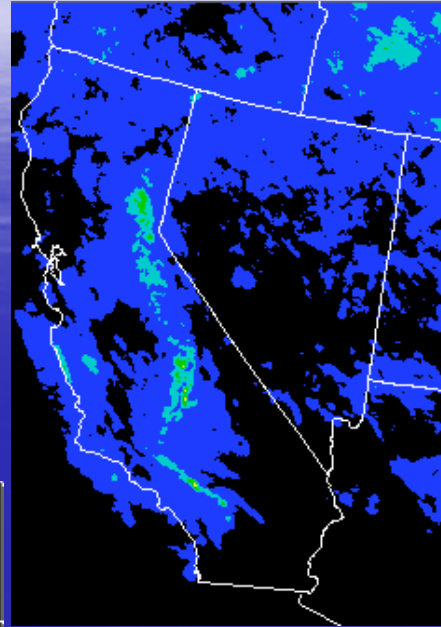
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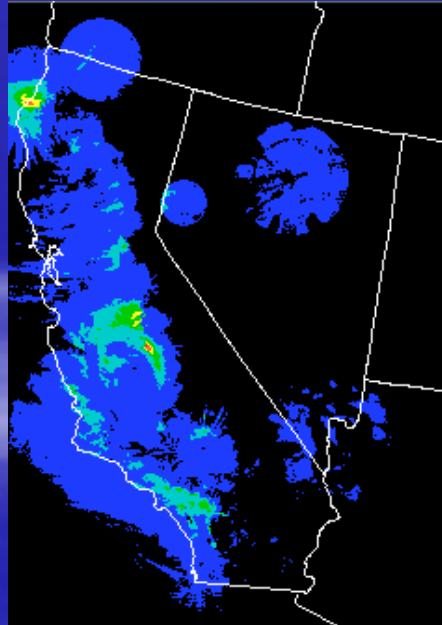
24-Hour 3-Sensor Precipitation Estimates



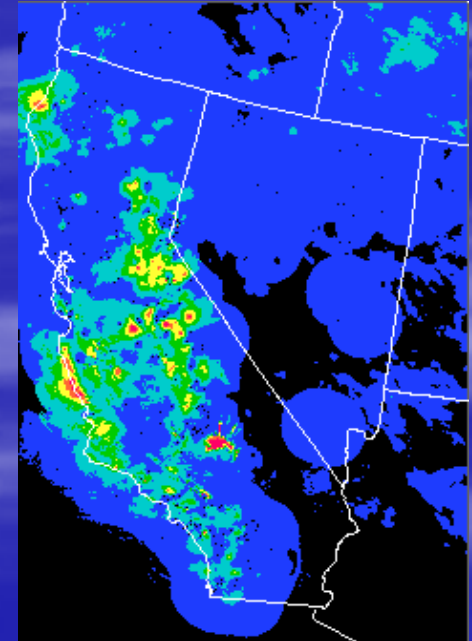
Gauge



Satellite



Radar



Merged Field

Upcoming Improvements

- MPE adaptable parameters changes
- Gauge QC features
- Bias-corrected satellite estimates
- Multisensor mosaic using local bias correction available as an option (rather than mean-field bias correction)
- Gauge/radar/satellite MPE
- Enhancements targeted primarily for WFO's:
 - Sub-hourly gauge data
 - MPE analyses at 2-km resolution
 - Sub-hourly MPE analyses
 - 0-1 hour rainfall amount nowcasts
- Range-corrected radar precipitation

Longer-term enhancements:

- Data from TDWR
- Dual-polarization estimates
- Radar estimates in probabilistic form
- Higher-resolution estimates from WSR-88D
- Precip estimates from NWP model output

Beyond precipitation:

- Potential evapotranspiration estimates using satellite-derived insolation
- Temperature analyses from NCEP operations

Possibilities for Probabilistic QPE

- RPG will output parameters for error distribution for rainfall estimate at each point
- Possible derived products:
 - Probability of any rain amount in given time period
 - Amounts corresponding to fixed probabilities
 - Range of rain amounts corresponding to a given confidence interval
- Potential applications:
 - Variable input to hydrologic models (input 70% exceedance threshold rain amount rather than deterministic amount)
 - Gauge QC

Future HL/DOH Contacts...

- DOH/RDM conference
- Probabilistic Quantitative Precipitation Estimation Advisory Group
- SR RFC/WFO gauge data working group