Multi-sensor Precipitation Estimator (MPE)

Jennifer H. Maxwell
Colorado Basin River Forecast Center

What Is MPE?

- MPE = multi-sensor precipitation estimator
- "MPE's focus is on areal estimations of rainfall amounts based on both remotely sensed data (radar, and eventually satellite) and actual observations (rain gages)."

Original Purpose

- The purpose of RFC-wide MPE is to create hourly gridded precipitation estimates which can be used to produce MAPX time series for input into NWSRFS
- MPE is intended to replace the stage2/ stage3 processing at River Forecast Centers

History

- Stage III (still being used by several RFC's)
- Stand alone version of RFC_wide (now called MPE) used at river forecast centers
- HMAP_MPE as part of WHFS Hydroview

MPE Primary Inputs/Outputs

- The primary inputs to MPE are the gridded DPA products and precipitation gage data.
- MPE creates hourly, gridded, multi-sensor precipitation estimates on a 4 km HRAP grid.

MPE Capabilities

- Multi-radar mosaic according to the lowest available height above sea level
- Individual radar coverage maps determined by HDP/DPA climatology
- Mean field bias adjustment of raw radar estimates through multiple time scales
- Merging of rain gage and radar data

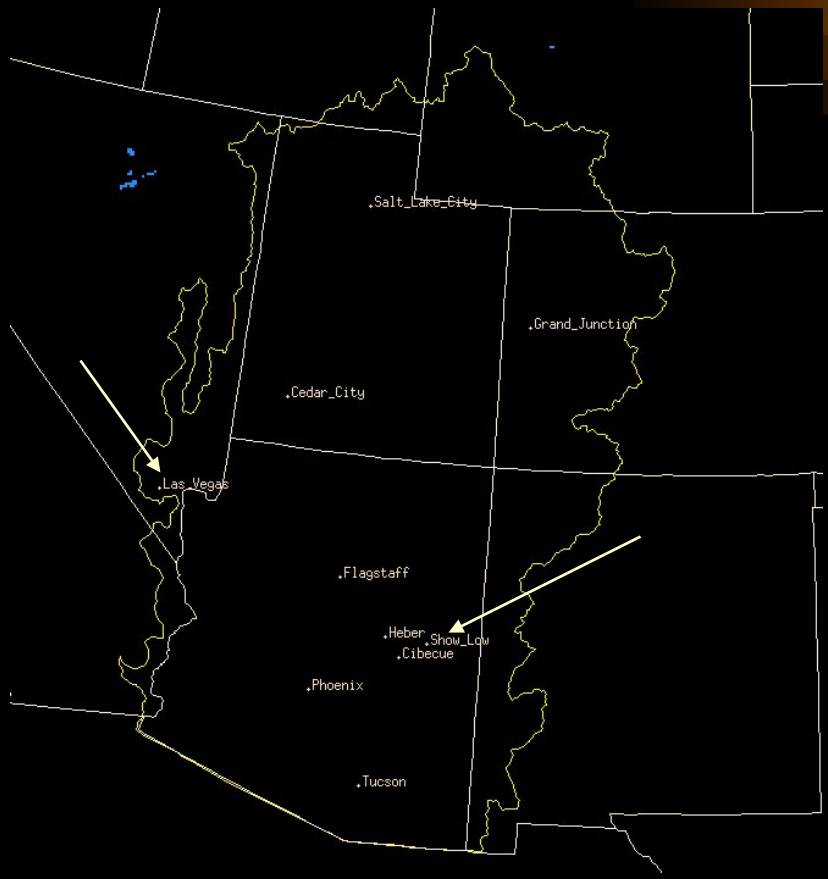
MPE Capabilities Cont.

- Local bias adjustment which varies from grid point to grid point
- Use and display of PRISM data
- Manual quality control of gage and radar data (GUI)
- Display and use of satellite-derived precipitation estimates (build OB1?)

Why Are We Using MPE?

- MPE creates a 1 hourly precipitation estimate that we can now feed into the model to support 1 hourly time segments
- Incorporates radar data
- Can QC the data

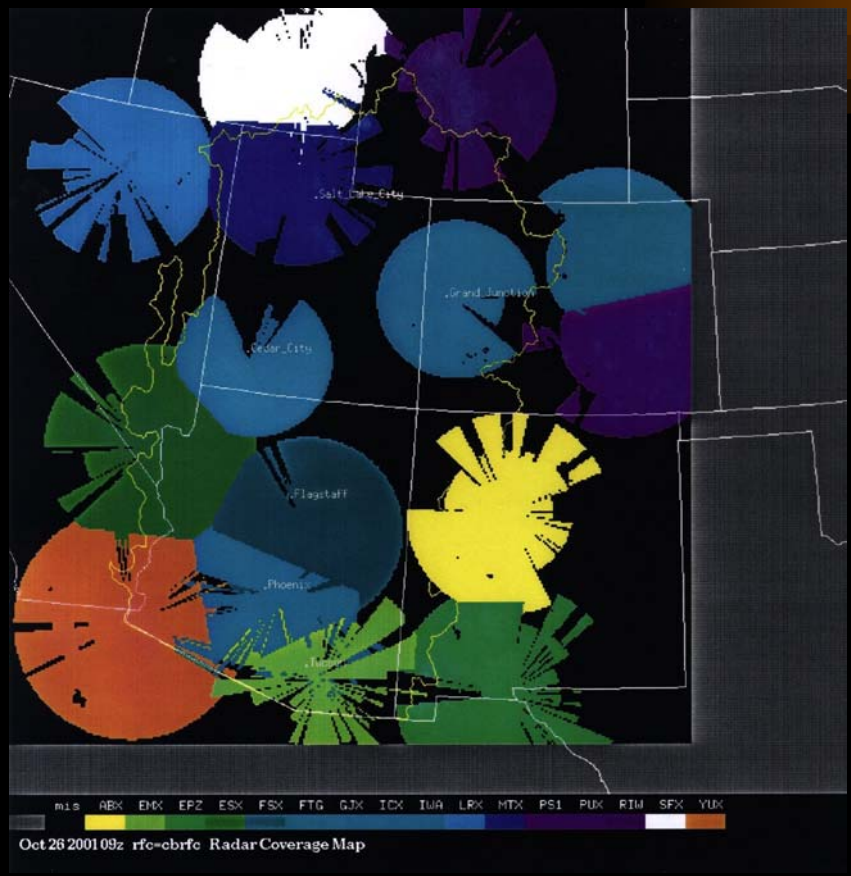
1 Hourly Time Segment Areas



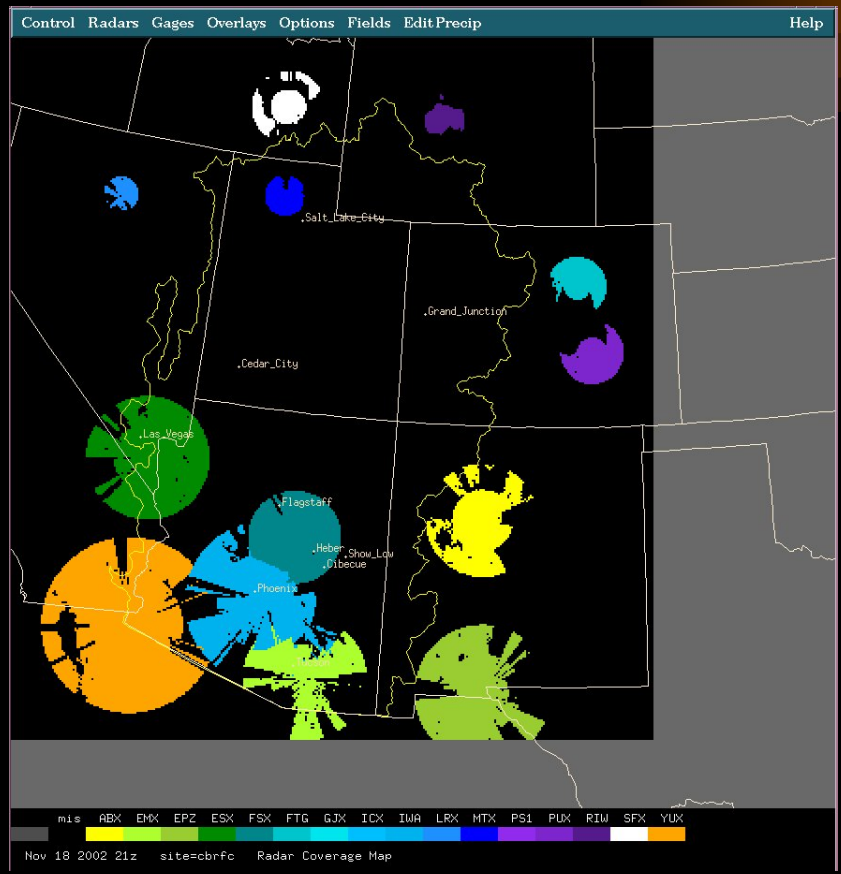
Radar Climatology

- Determination of "trusted" radar coverage
  - To compute radar-derived precipitation climatologies we used:
    - Frequency of precipitation
    - Defined a threshold to be placed on the precipitation estimates
    - Created different radar masks based on season and latitude
    - Choose lowest available coverage

Summer Radar Masks



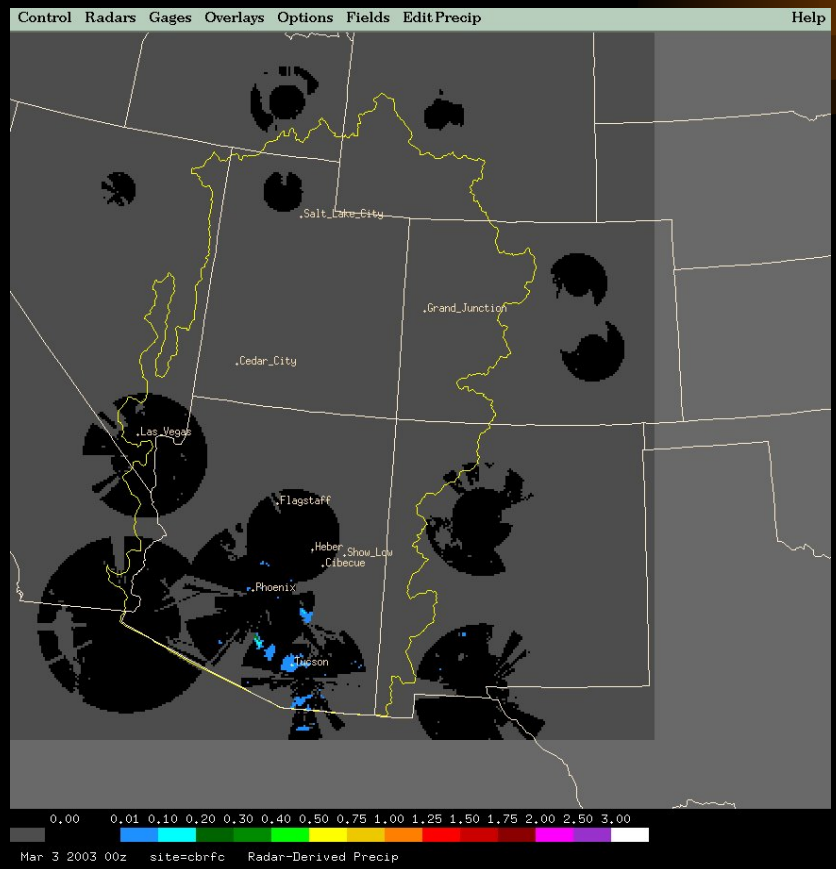
Fall/spring Radar Masks



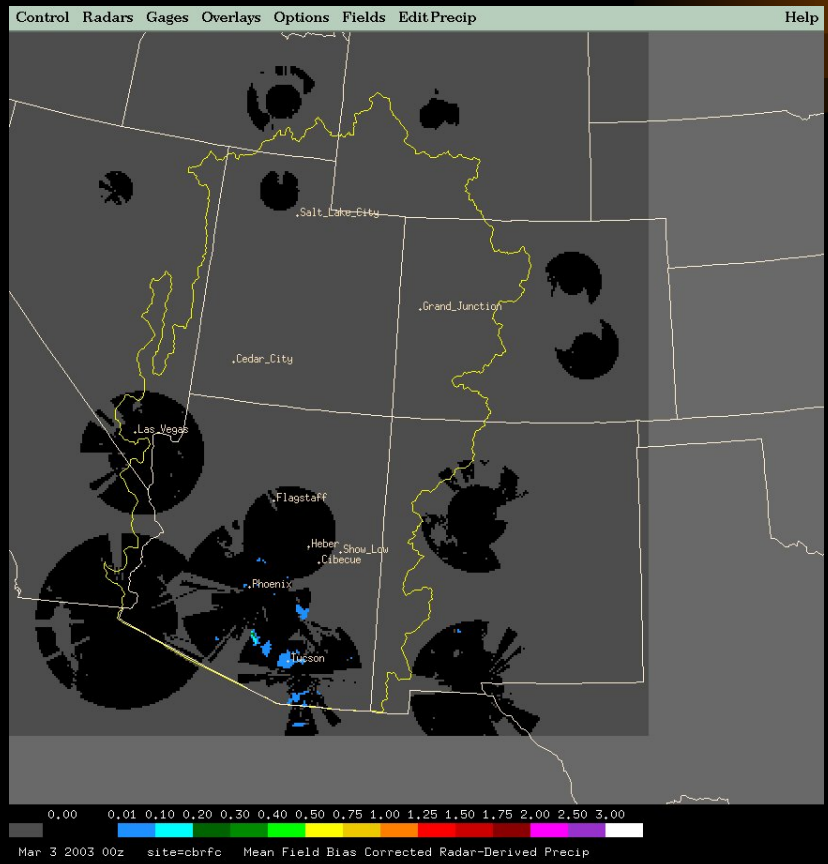
Displays in MPE

- Gridded precipitation products
- Other Gridded fields
- Tables
- Radar masks

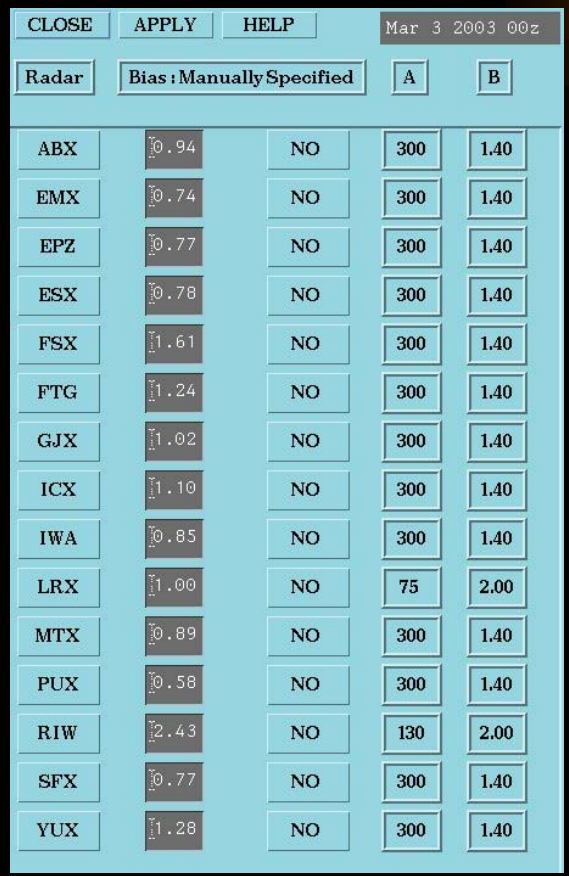
Raw Radar (RMOSAIC)



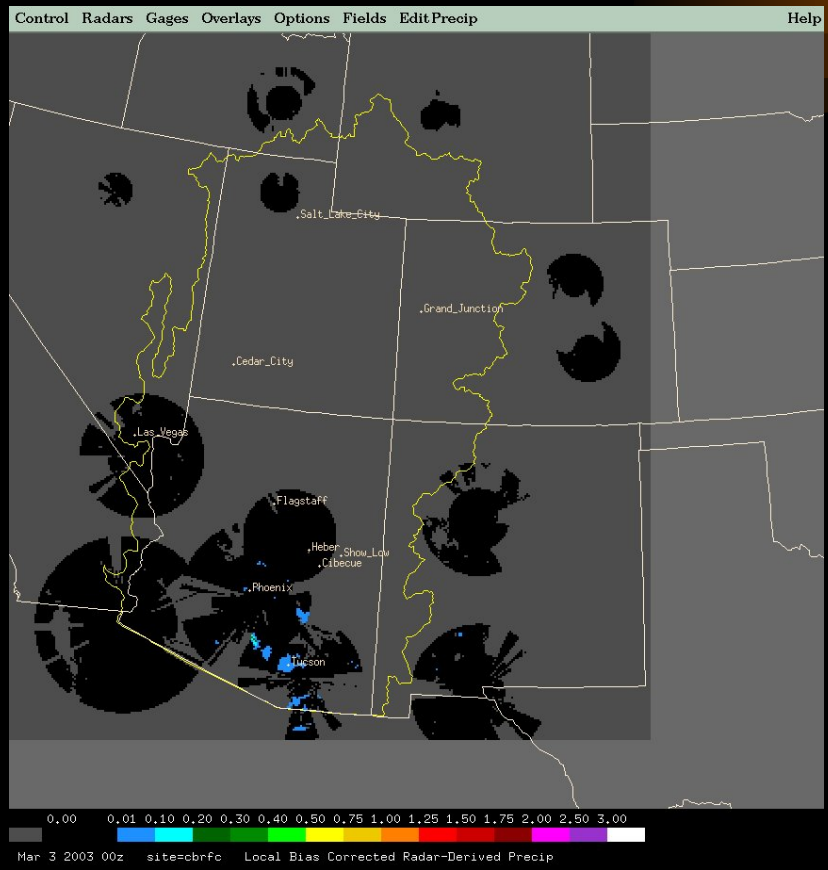
Bias Corrected Radar (BMOSAIC)



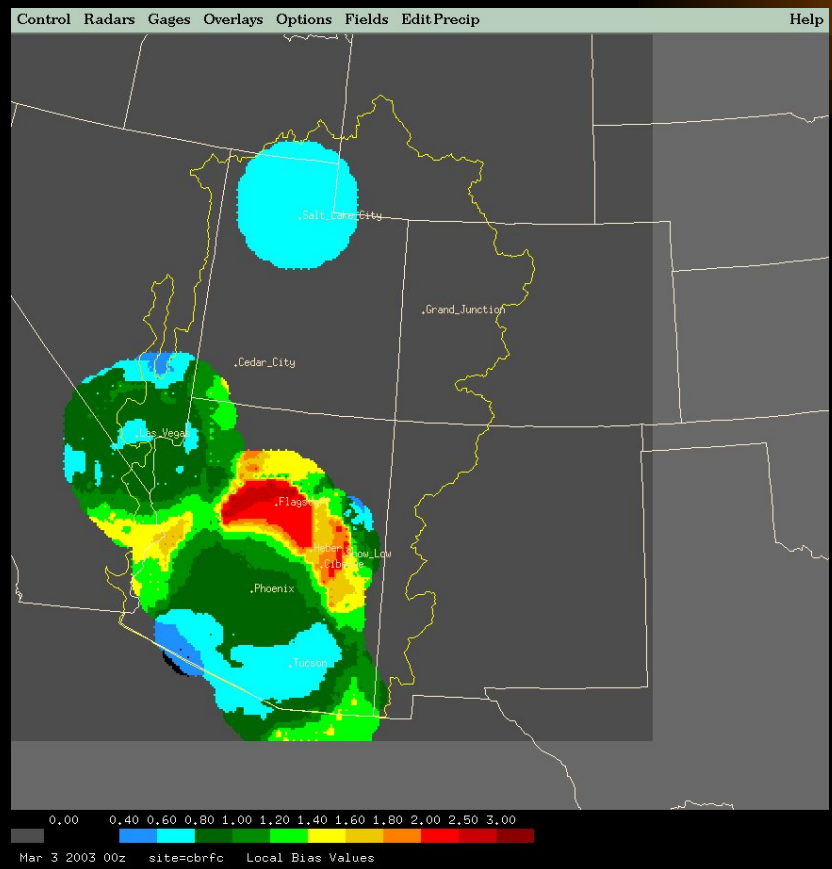
Bias Table


CLOSE
APPLY
HELP
Mar 3 2003 00z
Radar
Bias : Manually Specified
A
B
ABX 0.94 NO 300 1.40
EMX 0.74 NO 300 1.40
EPZ 0.77 NO 300 1.40
ESX 0.78 NO 300 1.40
FSX 1.61 NO 300 1.40
FTG 1.24 NO 300 1.40
GJX 1.02 NO 300 1.40
ICX 1.10 NO 300 1.40
IWA 0.85 NO 300 1.40
LRX 1.00 NO 75 2.00
MTX 0.89 NO 300 1.40
PUX 0.58 NO 300 1.40
RIW 2.43 NO 130 2.00
SFX 0.77 NO 300 1.40
YUX 1.28 NO 300 1.40

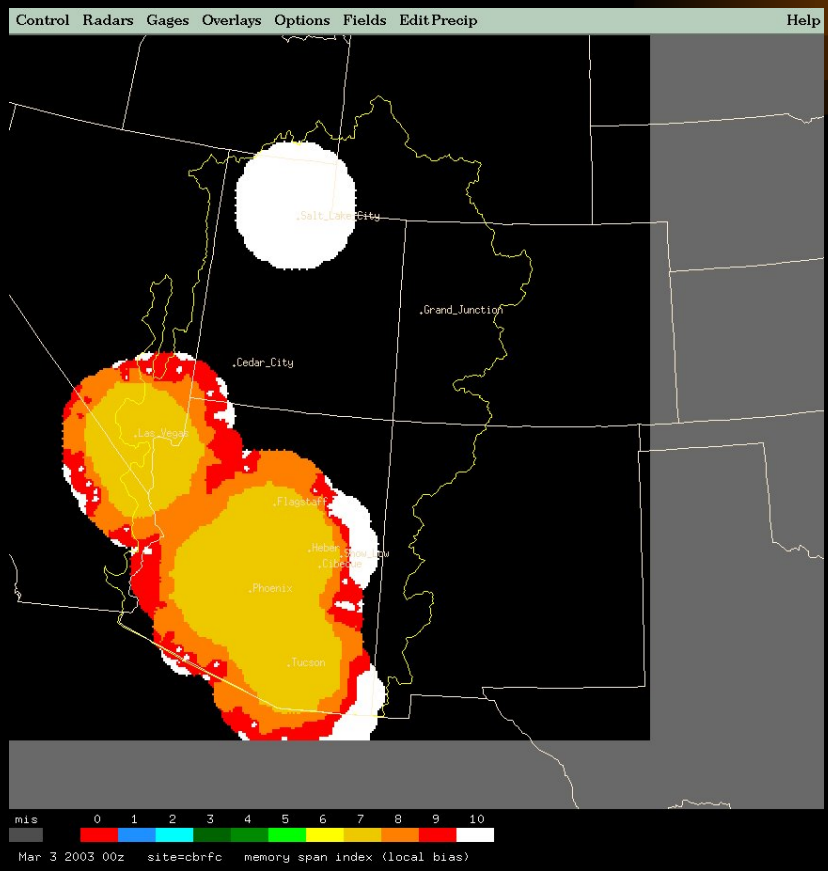
Local Bias (LMOSAIC)



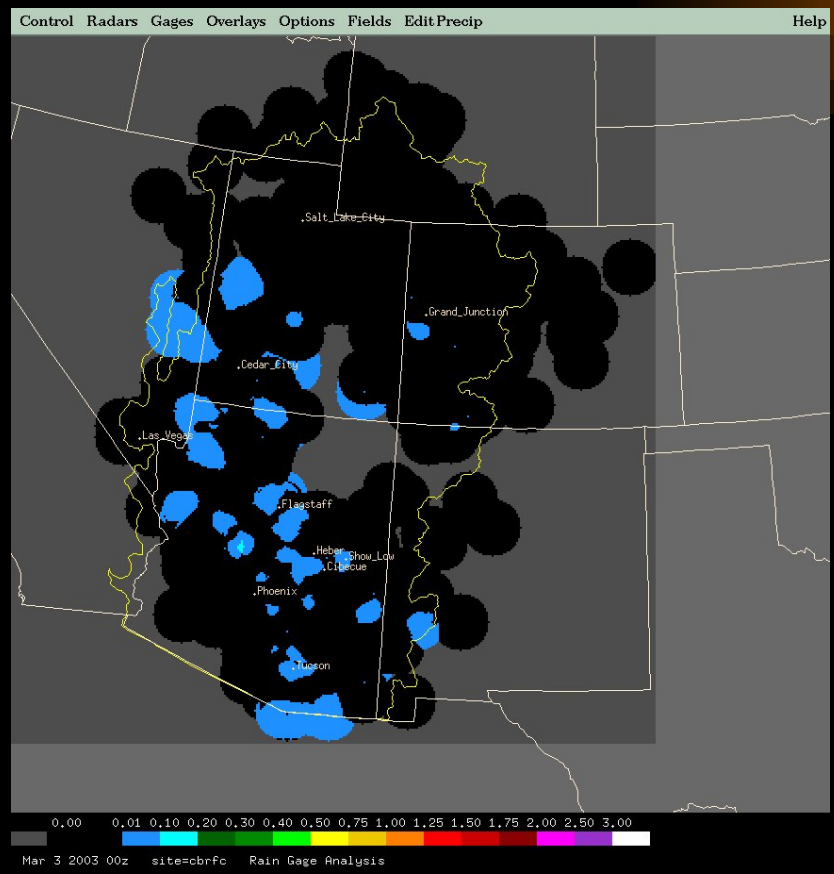
Bias Correction Factor (LOCBIAS)



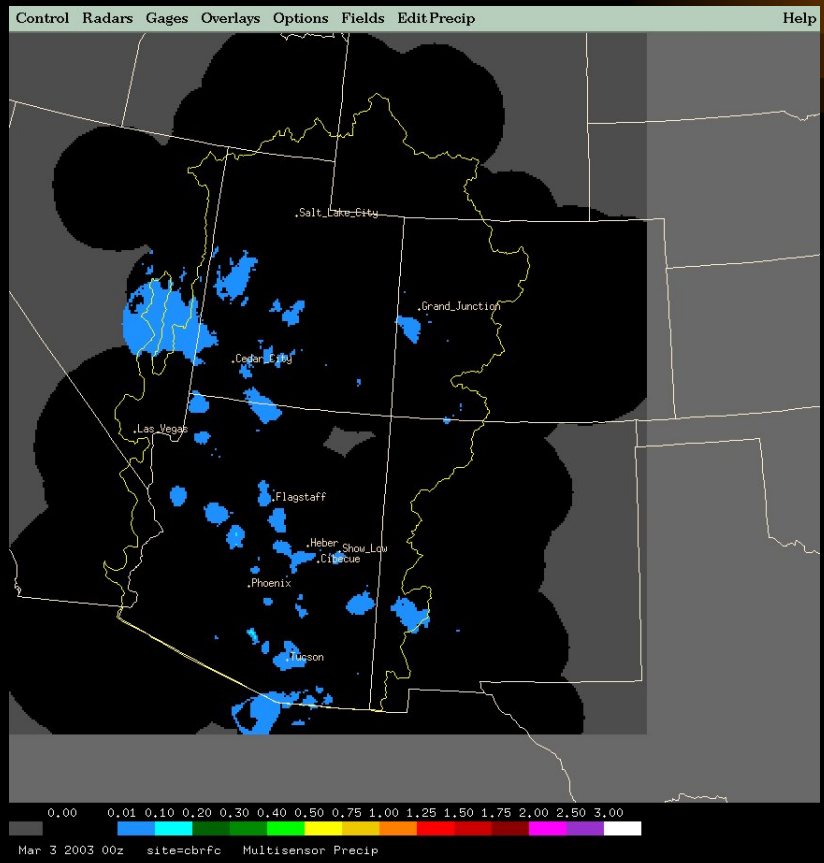
Memory Span (LOCSPAN)



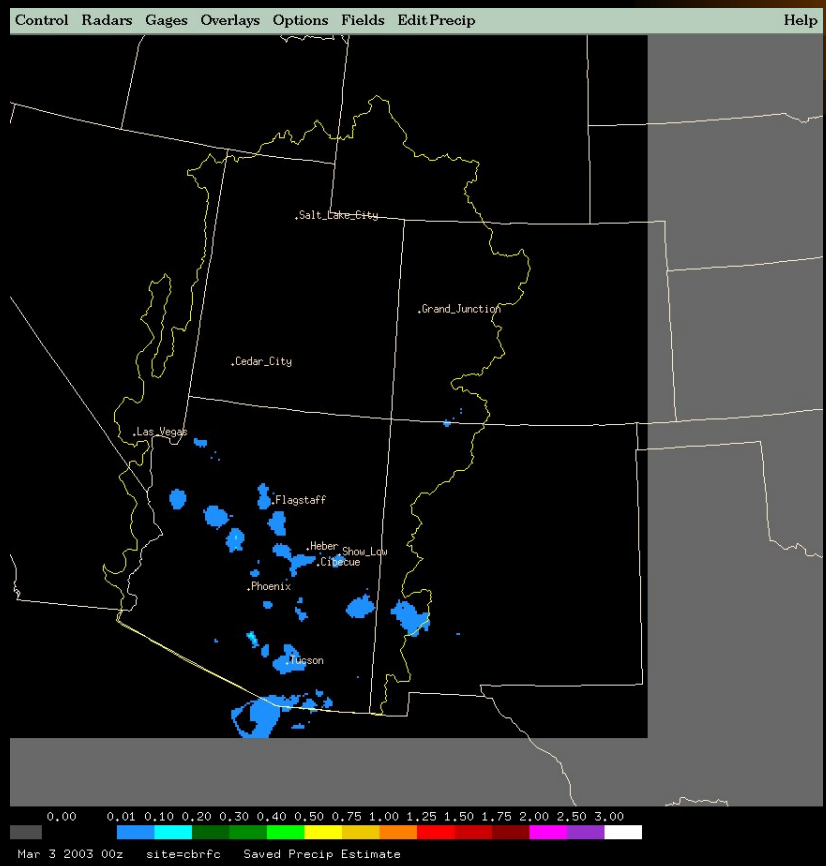
Gage Only


Control Radars Gages Overlays Options Fields Edit Precip Help
.Salt_Lake_City
.Grand_Junction
.Cedar_City
.Las_Vegas
.Flagstaff
.Heber
.Show_Low
.Cibecue
.Phoenix
.Tucson
0.00 0.01 0.10 0.20 0.30 0.40 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.50 3.00
Mar 3 2003 00z site=cbrfc Rain Gage Analysis

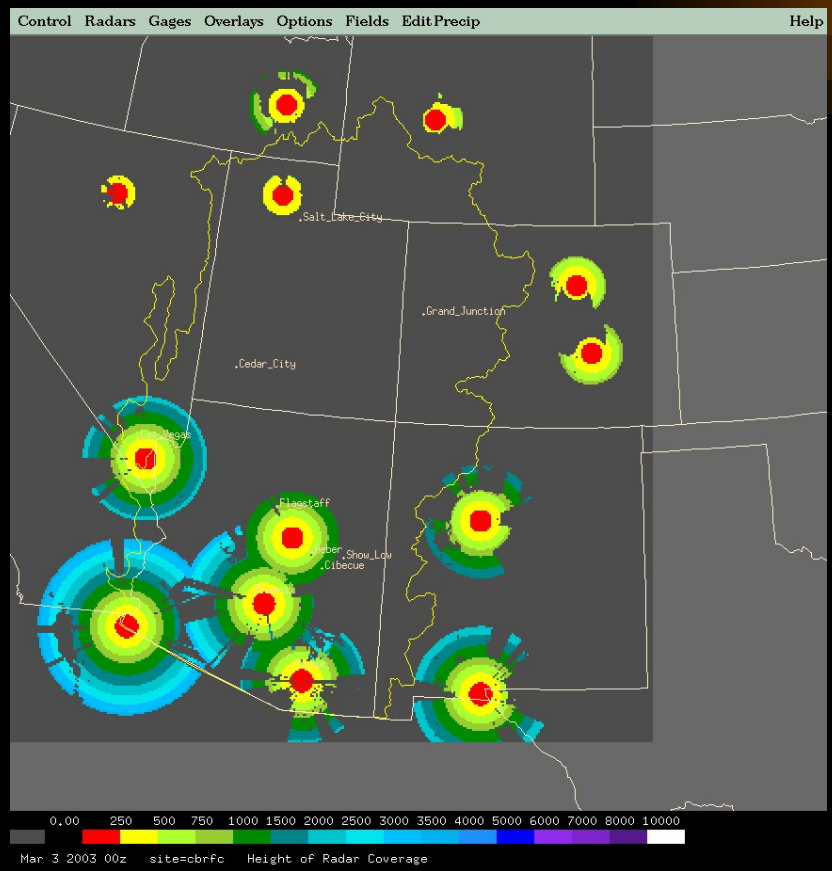
Multi-sensor (MMOSAIC)



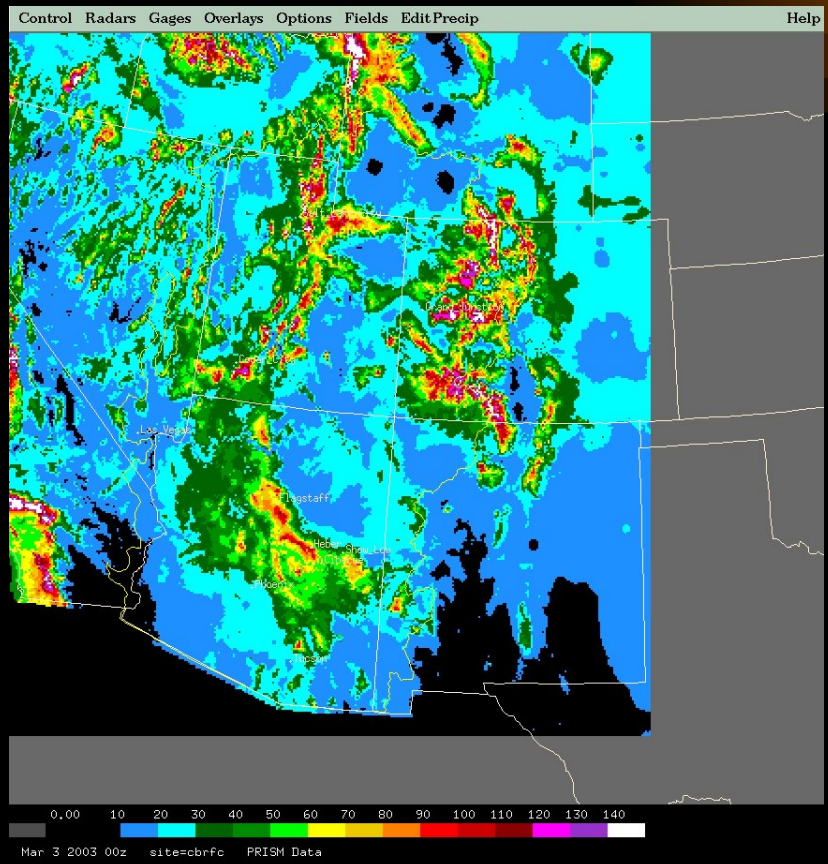
XMRG (Saved Product)



Height of Radar Coverage



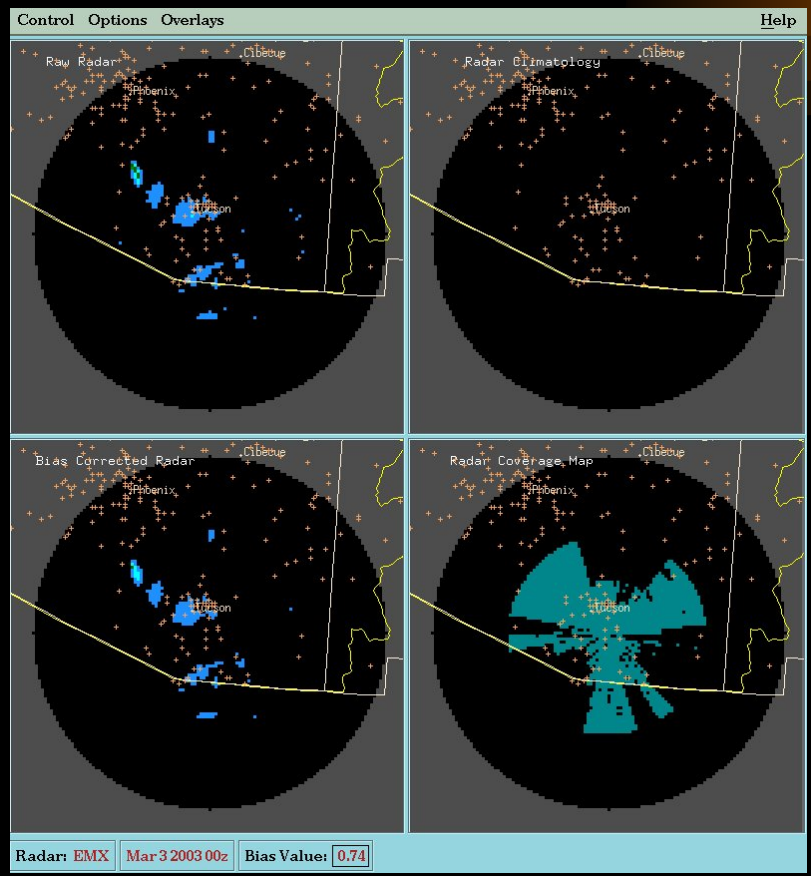
Prism Data


Control Radars Gages Overlays Options Fields Edit Precip Help
Las Vegas
Flagstaff
0.00 10 20 30 40 50 60 70 80 90 100 110 120 130 140
Mar 3 2003 00z site=cbrfc PRISM Data

Gage Table


Control
Sort Gages
Help
GageID
Gage
Edit
CKGA3
0.12
MTUA3
0.12
YBMA3
0.08
YLBA3
0.08
YWSA3
0.08
QBRA3
0.07
YAPA3
0.07
QPAA3
0.06
TUS
0.06
CPWA3
0.05
QCKA3
0.05
QFSA3
0.05
QMBA3
0.05
ACPA3
0.04

Single Radar Site



Forecaster Input

- Ability to edit the gridded data fields as well as the point gage observations
- Provides tools to edit gage values, bias values, Z-R relationship values, and then rerun estimation algorithms
- The user can add a pseudo gage to adjust the radar values

Forecaster Input

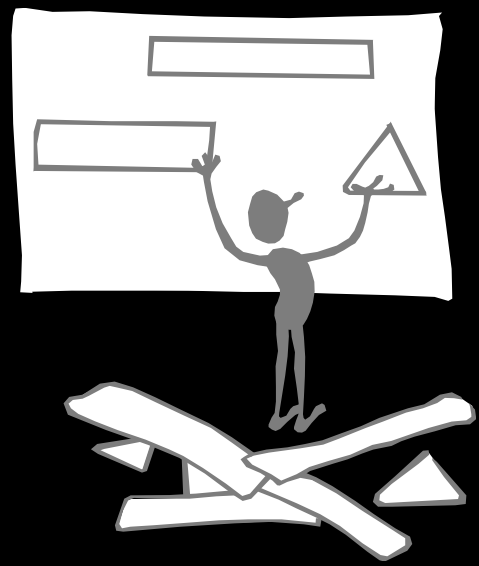
- There is also an edit precipitation capability which allows the user to draw a polygon around a region of interest. The user can then substitute any of the precipitation fields (RMOSAIC, BMOSAIC, MMOSAIC, LMOSAIC, SATELLITE) into the region outlined by the polygon.
- After a forecaster has finished analyzing and editing the precipitation data, the final analysis can be saved as an xmrg file for input into MAPX.

Problems in the West

- Limited “trusted” radar coverage
- Some areas with no gage/radar values
- Gage radius of influence
- Radar bias (i.e. RIW problems)
- Satellite estimates not available yet
- Adding our own estimates?

Local Changes

- Increased radius of influence on gages
- Changed precipitation amount for gage-radar pairs (take fewer pairs to adjust radar bias)
- Modified radar coverage



Documentation

- http://www.nws.noaa.gov/oh/hrl/presentations/mpe_training_wkshp_0601/course_outline.htm
- http://www.nws.noaa.gov/oh/hod_whfs