Geographic Extent of Effective Radar Precipitation Detection

David Kitzmiller, Dennis Miller, Wanru Wu, Ziya Zhang, Nathan Patrick
National Water Center
July 15, 2015
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• Current applications like AWIPS MPE rely on 0/1 mask to outline areas of effective radar coverage
• Radar QPE is accepted within the mask
• Radar QPE is ignored outside the mask
• Seasonal dependence generally included
• To date, masks are subjectively defined

• *Desire an objective, more flexible method of masking*
Potential Methods/Metrics

- We don’t have many rain gauges for comparison
- NSSL Multi-Radar Multi-Sensor (MRMS) has radar quality field based on beam elevation, freezing level height
  - Has been related to QPE error but not detection
- Other possibilities:
  - Radar QPE correlation with gridded gauge-based analyses
  - Radar QPE precip *relative frequency* compared to *climatology*
- Application below is for pre-NEXRAD Manually-Digitized Radar (MDR) data
Manually-Digitized Radar (MDR)  
15–03 UTC, 3-4 Sept 1979
Manually-Digitized Radar Reflectivity

- Collected from 1960’s through 1994
- From WSR-57 and WSR-74 sites
- Derived by inspection of Digital Video-Integrator and Processor (DVIP) display relative to 40-km map grids
- Local grids submitted 1x per hour, along with text descriptions, via teletype
- Archived by NWS Techniques Development Laboratory, available from NCAR

*We will use MDR solely to disaggregate daily precip obs to hourly, not for direct QPE estimation*
Gauge- and MDR-based % precipitation hours
January – California Sites

Radar detected only a fraction of precipitation at Blue Canyon and Calaveras
Ratios of % precipitation hours

- Figures below show:
  \[ \frac{\sum \text{(Hours VIP > 0)}}{\sum \text{(Hours obs. Precip)}} \]

- Data collected 1978-1994
- All available days, 0000, 0300, ..., 2100 UTC
- Remember WSR-57/WSR-74 radar sites were different from WSR-88D
- Ratios are often > 1 due to 1600 km\(^2\) radar sampling
January
July
Proposed Application for Multi-Sensor Analysis

• Current AWIPS MPE and some other applications use simple 0/1 radar mask

• Propose to flexible mask:
  – If MDR/precip ratio > 0.8, accept radar QPE as is
  – Otherwise:
    • If MDR > 0, accept as precip
    • If MDR = 0, treat as missing

• MDR results shown at EWRI/WRAH conference 2014, submitted to J. Hydrology 2015

• Work is ongoing to define coverage for Stagell, MRMS QPE
Correlation between MRMS Gauge-Corrected 24h QPE and StageIV/CMC 24h gauge-multisensor QPE
April-June 2015