



NOAA RESEARCH • ESRL • PHYSICAL SCIENCES DIVISION

Role of Gap-Filling Radars to Improve QPE in Complex Terrain

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Assessing Impacts of Extreme Precipitation Events in the Russian River Basin

- Wintertime storms can cause flooding
 - Impact to water supplies, wineries, and fish
- Forecasters, water-emergency managers need best possible water information to manage risk
 - Inform public of potential flooding and manage competing demands for water
- Climate change likely to increase occurrence of extreme precipitation events

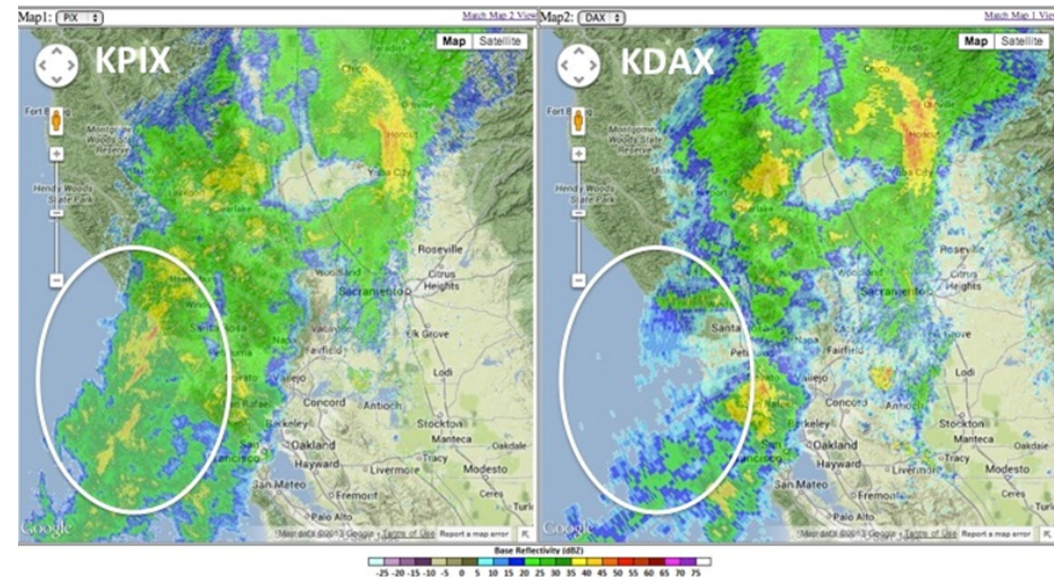


Radar Coverage in the Russian River Basin

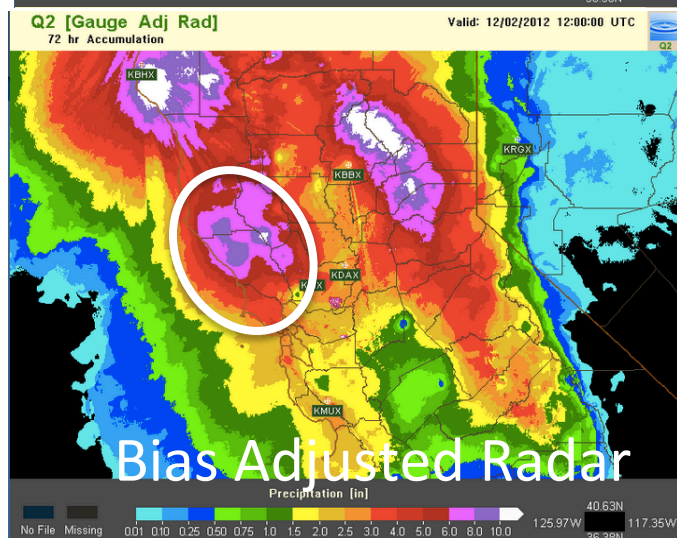
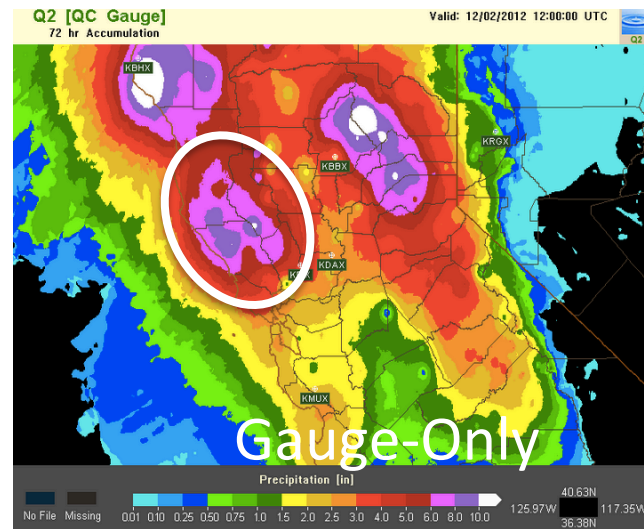
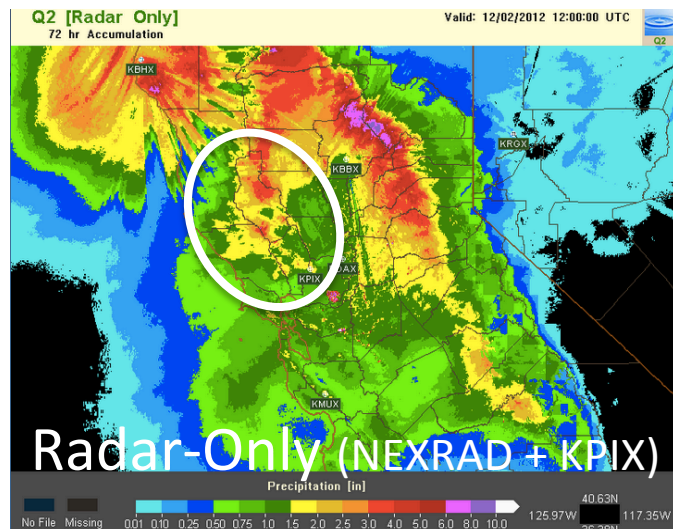
- Poor NEXRAD coverage
 - Beam blockage
- Commercial radar (KPIX) improves coverage
 - Improvement in lower Russian and offshore
- NWS uses KPIX to improve “situational awareness”
 - Impact on QPE is unclear
- PSD research aimed at quantifying added value of commercial radar data
 - best approach to produce quantitative precipitation estimates (QPE)

Commercial TV

NEXRAD



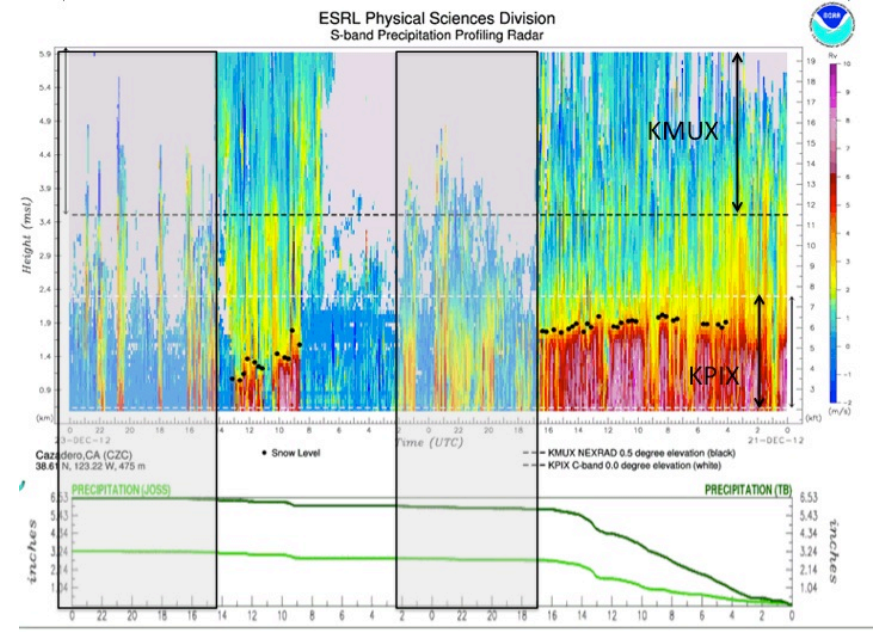
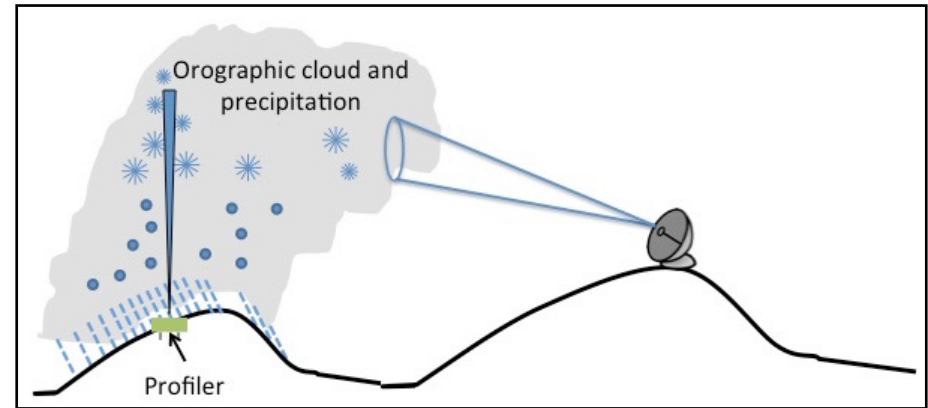
Sensor Input Has Big Impact on QPE



- Multi Radar-Multi Sensor (MRMS) QPE
 - 3 day accumulation ending December 2, 2012
- Which QPE is correct?

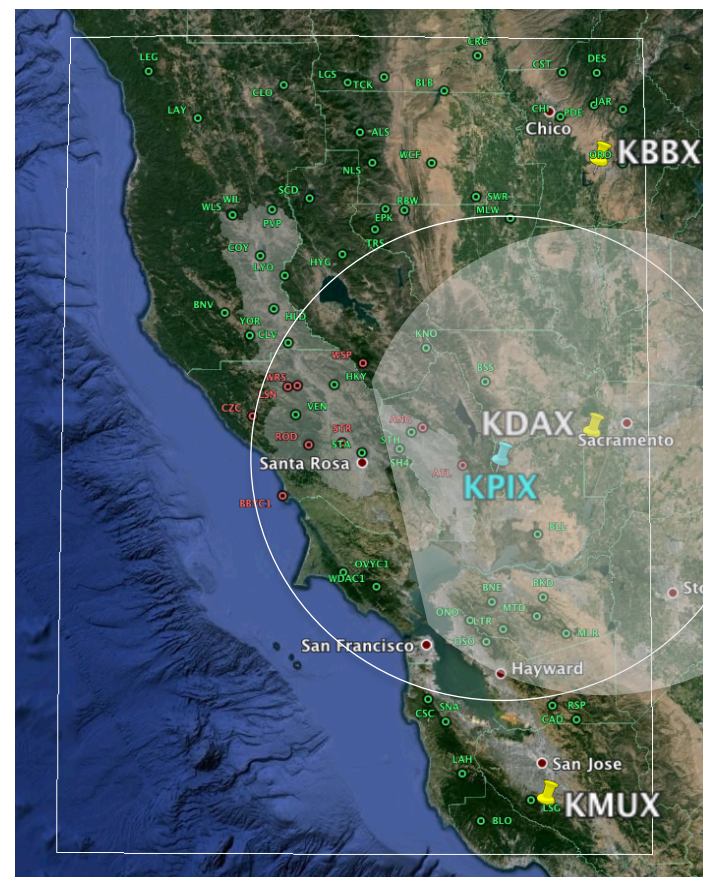
Precipitation Characteristics: Impact on QPE

- NEXRAD often observes in the upper part of the storm
 - Above the rain region
- Orographic precipitation often produced at low levels and missed by NEXRAD
 - ~1/4-1/3 of precipitation in this region results from shallow rain (White et al. 2003)
- KPIX samples below the melting level (radar bright band)
 - Hypothesize that this results in more accurate estimates of rainfall



QPE Assessment Analysis

- Multi-Radar Multi-Sensor (MRMS)
 - Retrospective version at PSD
 - QPE Products
 - 1 km, hourly
 - Radar-only, Gauge-only, Gauge-adjusted radar
 - Radar Data
 - NEXRAD (KMUX, KDAX, KBBX, KBHX)
 - Commercial (KPIX)
 - 53 analysis gauges
 - 9 independent gauges
 - Operational MRMS does not use independent gauges



Analysis gauges



Validation gauges



NEXRAD Radar

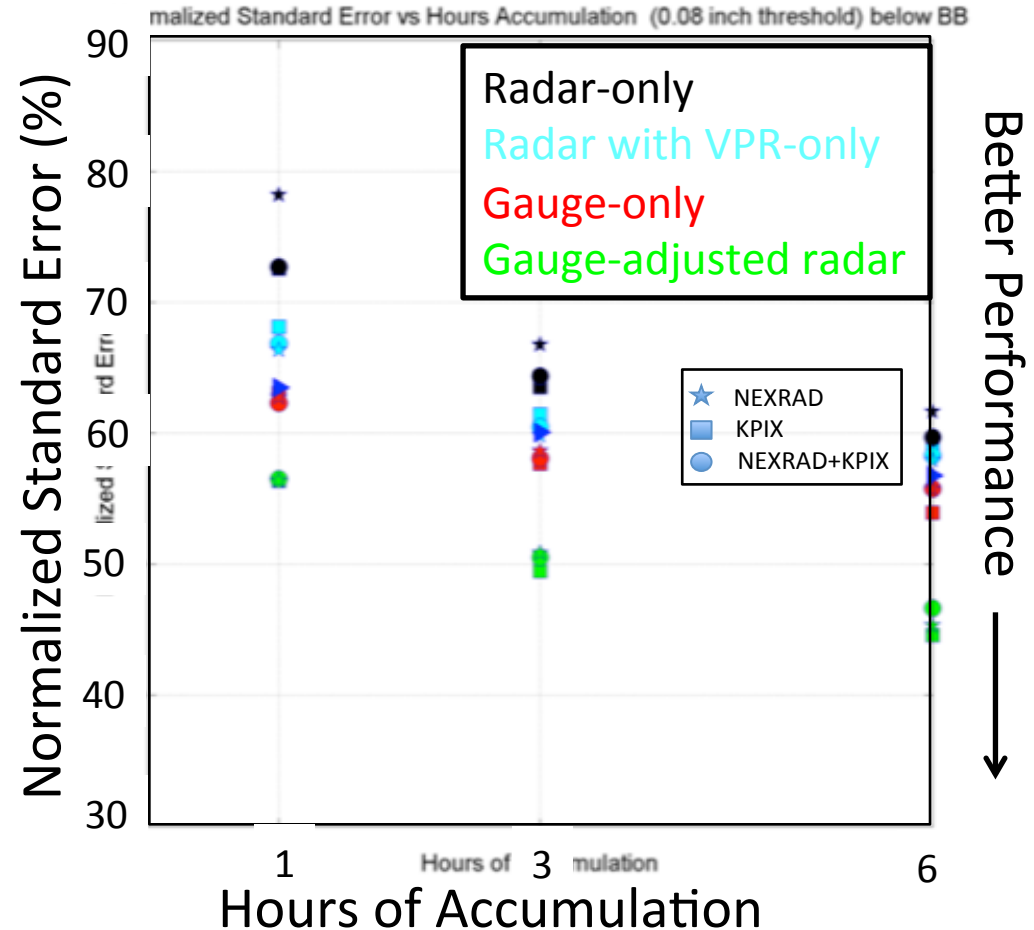


Commercial radar



Results: 7 Events (27 days)

- Errors are large
 - Complex precipitation processes
- KPIX improves radar-only estimate of QPE relative to NEXRAD
 - Impact varies by event
- Gauge adjusted radar produces the best QPE
 - Impact of KPIX is minimal



Summary

- QPE has large uncertainty (*see poster by Sheurer*)
 - Combination of terrain and complex precipitation processes
- KPIX improves radar QPE compared to NEXRAD
 - NEXRAD often underestimates relative to KPIX
 - KPIX impact varies case to case depending on radar scanning strategy, calibration, and precipitation processes dominating each event
- Best QPE is gauge adjusted radar
 - Radar captures precipitation gradients
 - Gauges correct radar underestimates
 - Impact of KPIX is small
- Quality of QPE has implications for flash flood forecasting (*see poster by Zamora*)
 - NRC “Network of Networks” study
 - Applicability of commercial radar nationwide

