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A Case for Gap-Filling Radars: The 29 September 2014 Severe Weather Event over Southwest Colorado

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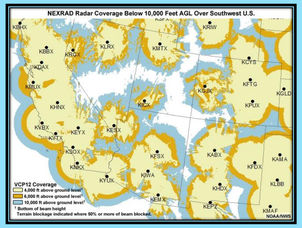
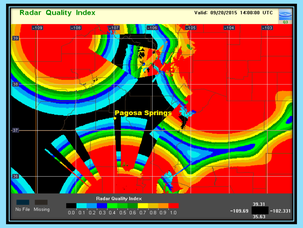
NWS Radar Coverage Over SW Colorado

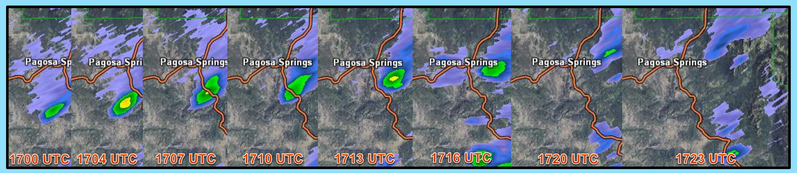
The graphics below illustrate the lack of quality WSR-88D sampling over large portions of the intermountain West and specifically near Pagosa Springs, Colorado (**PSO**).

➢The KGJX 88D is located on the Grand Mesa at a height of 10,200 feet MSL. The center beam height of the 0.5° cut is ~19,200 feet MSL near Pagosa Springs. The KABX 88D 0.5° cut, near Pagosa Springs, samples ~3,000 feet lower than KGJX but the radar beam can be nearly 100% blocked in the 357° to 004° range under certain atmospheric conditions

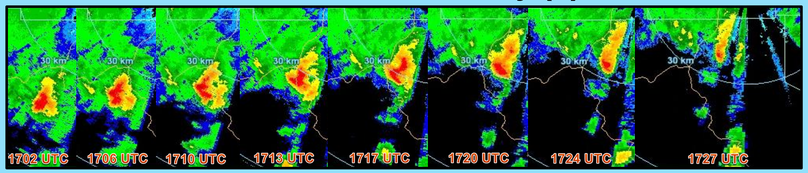




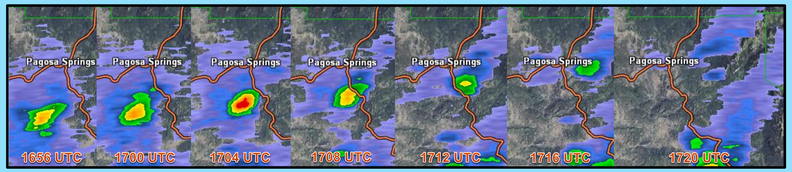
Storm Evolution



KGJX 0.5° Reflectivity (Z)



OU PX-1000 3.0° Reflectivity (Z)

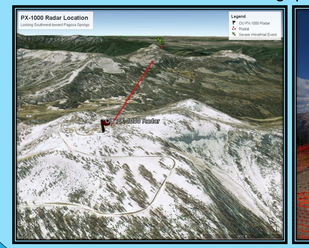


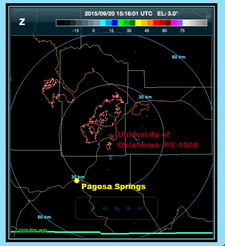
KABX 0.5° Reflectivity (Z)

OU PX-1000 Background

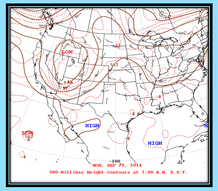
The PX-1000 is maintained and operated by the Advanced Radar Research Center (ARRC) of the University of Oklahoma.

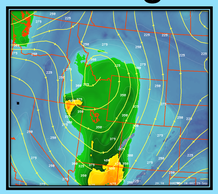
- Project partners include RWEACT-WIn (Rio Grande Watershed Emergency Action Coordination Team – Watershed Initiative), the USDA Forest Service, and the Office of Emergency Management (San Luis Valley and Southwest Regions)
- The risk of flooding or mudslides from the 2013 wildfires continue
- This project aided local EMs and the NWS providing real-time and archived data facilitating the examination of the benefits of a gap-filling radar over the area

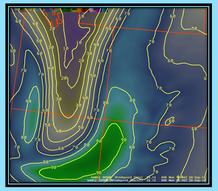




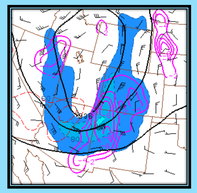
Storm Background

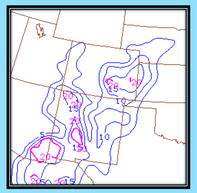


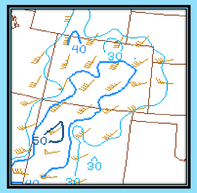




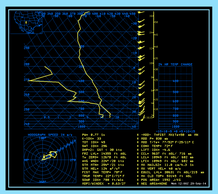
WPC 12 UTC 29 September 500 hPa heights (left), NAM 18 UTC 1.5 PVU pressure (image) with 500 hPa streamlines (center) and NAM 18 UTC 300 hPa image overlaid with contours (right)

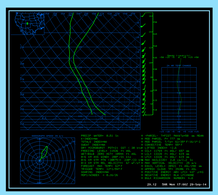


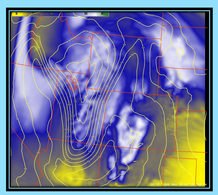




SPC Mesoscale Analysis 18 UTC 29 September 300 hPa Jet Circulation and 700-500 hPa Avg Omega (left), Craven/Brooks Significant Severe composite index (center), Effective Bulk Shear (right)



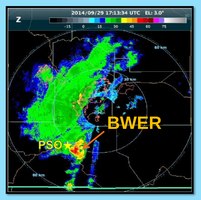


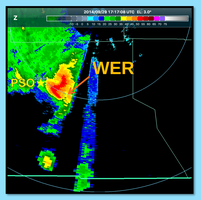


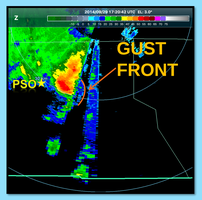
12 UTC 29 September KABQ Sounding (left), RAP 17 UTC PSO Forecast Sounding (center), NAM 18 UTC 500-300 hPa Relative Humidity (image) and 300 hPa isotach contours (right)

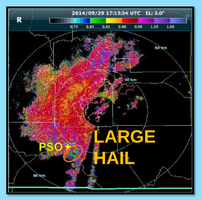
Storm Scale Features

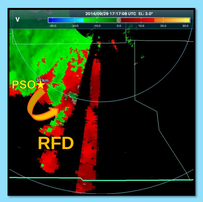
Utilizing the OU PX-1000 Gap Filling Radar

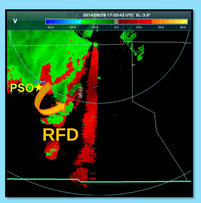












Reflectivity (Z), Velocity (V), Correlation Coefficient (R)

Overview

➢RADAR Background

- ➢Existing WSR-88D RADAR is limited due to:
  - ➢Distance from the GJX RADAR to storm location ~235 KM
  - ➢Widespread beam blockage due to complex terrain
  - ➢Dual-Pol base products and radar algorithms unreliable in low topped precipitation events, especially over valley locations
- ➢Transportable PX-1000 RADAR (X-Band) is situated near Wolf Creek Pass at an elevation of ~11,700 feet MSL
  - ➢Placed at current site to aid collaboration between local, state and federal partners providing support for localized flash flood threat
  - ➢Had a favorable view in the direction of the developing severe thunderstorm near Pagosa Springs

➢Storm Overview

- ➢Synoptic pattern of upper jet reforming on upstream side of closed low pressure system favored thunderstorm development over southwest Colorado
- ➢Wind shear and instability parameters on the KABQ 12 UTC RAOB and RAP proximity soundings at 17 UTC suggested convection would be low topped
  - ➢Several SPC Mesoanalysis severe products suggested storms would be crossing localized gradients in the vicinity of Pagosa Springs
- ➢RADAR interrogation of storm structure supports mini supercell storm mode
  - ➢Reports of golf ball sized hail were received south of Pagosa Springs
  - ➢Live-growth trees in an 8 square mile area were snapped near ground level or completely uprooted as rear flank downdraft winds reached the surface producing winds in excess of 75 mph

➢Summary

- ➢This case demonstrates the benefits for a gap-filling RADAR over the region
- ➢Pre-storm and near storm analysis is vital due to limited radar coverage
- ➢Future studies utilizing a gap-filling RADAR during shallow, winter stratiform precipitation events could prove beneficial for decision support services in areas of complex terrain