

AR Recon's "Final Mile"

Mobile Radar Platforms & the RAPID-FIRE Field Campaign

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2. Department of Geography, The Ohio State University

AR Recon Workshop
29 June 2026



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and Water Extremes
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UC San Diego



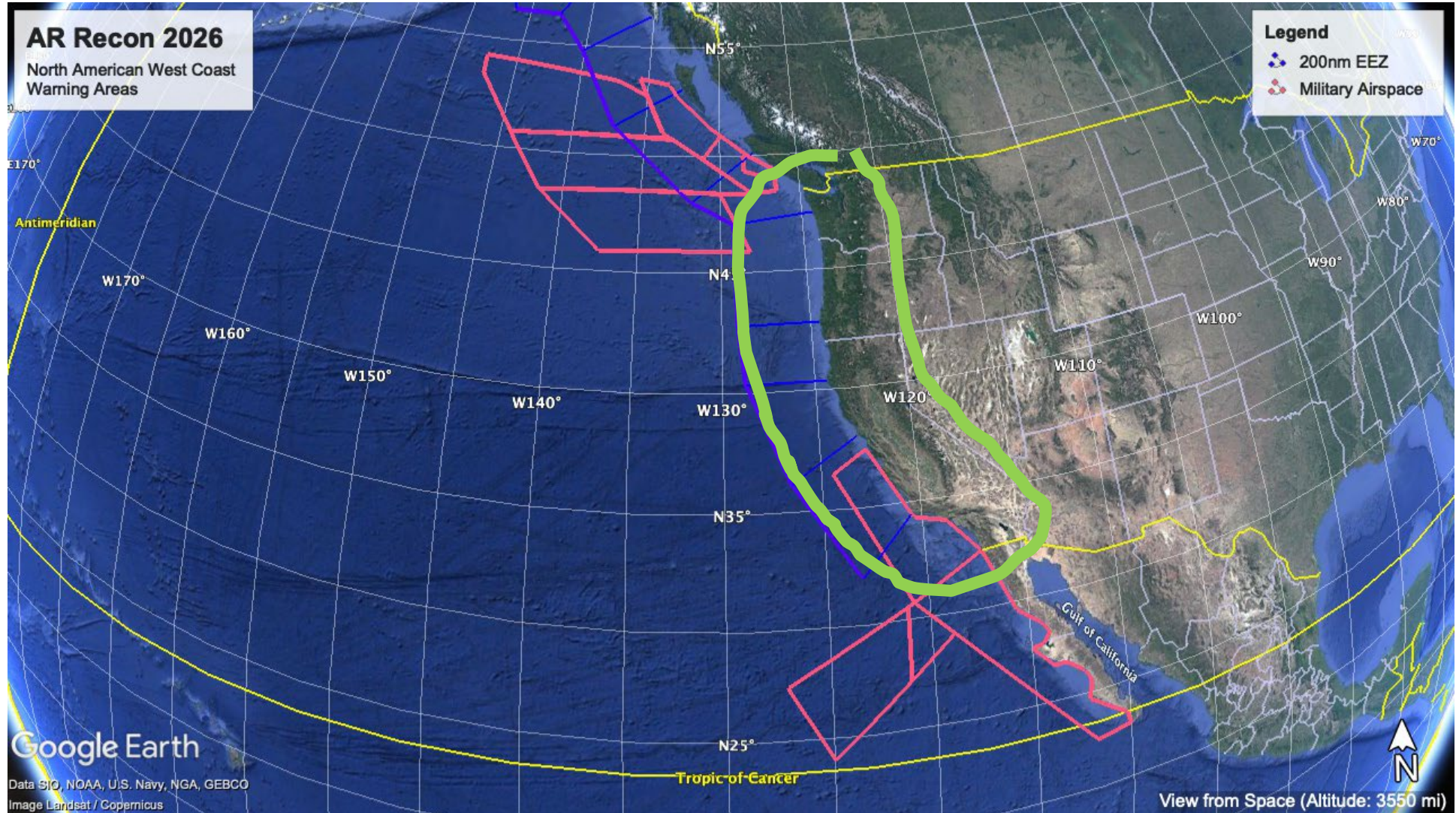
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The "Final Mile"



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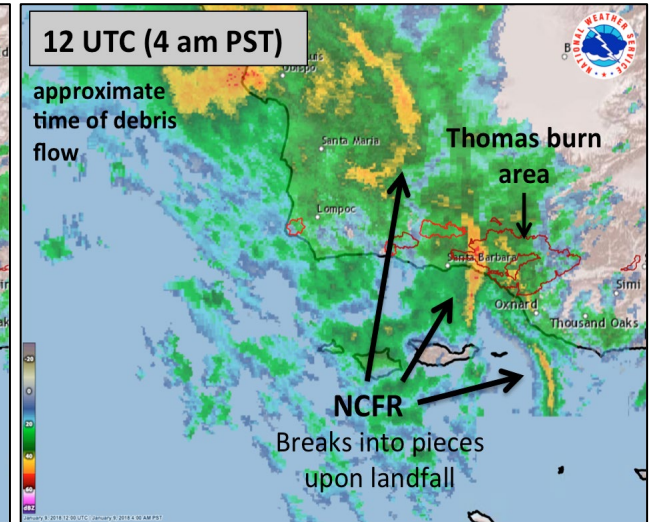
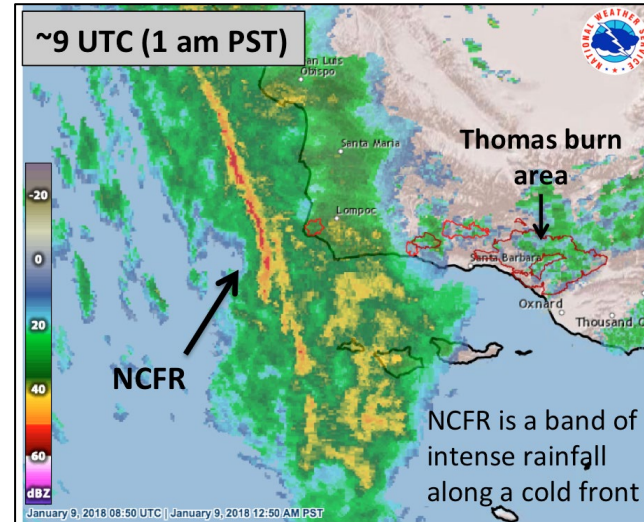
Narrow Cold -Frontal Rain bands (NCFRs)



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NCFRs produce extreme rain, often embedded within longer-duration periods of moderate/heavy rain

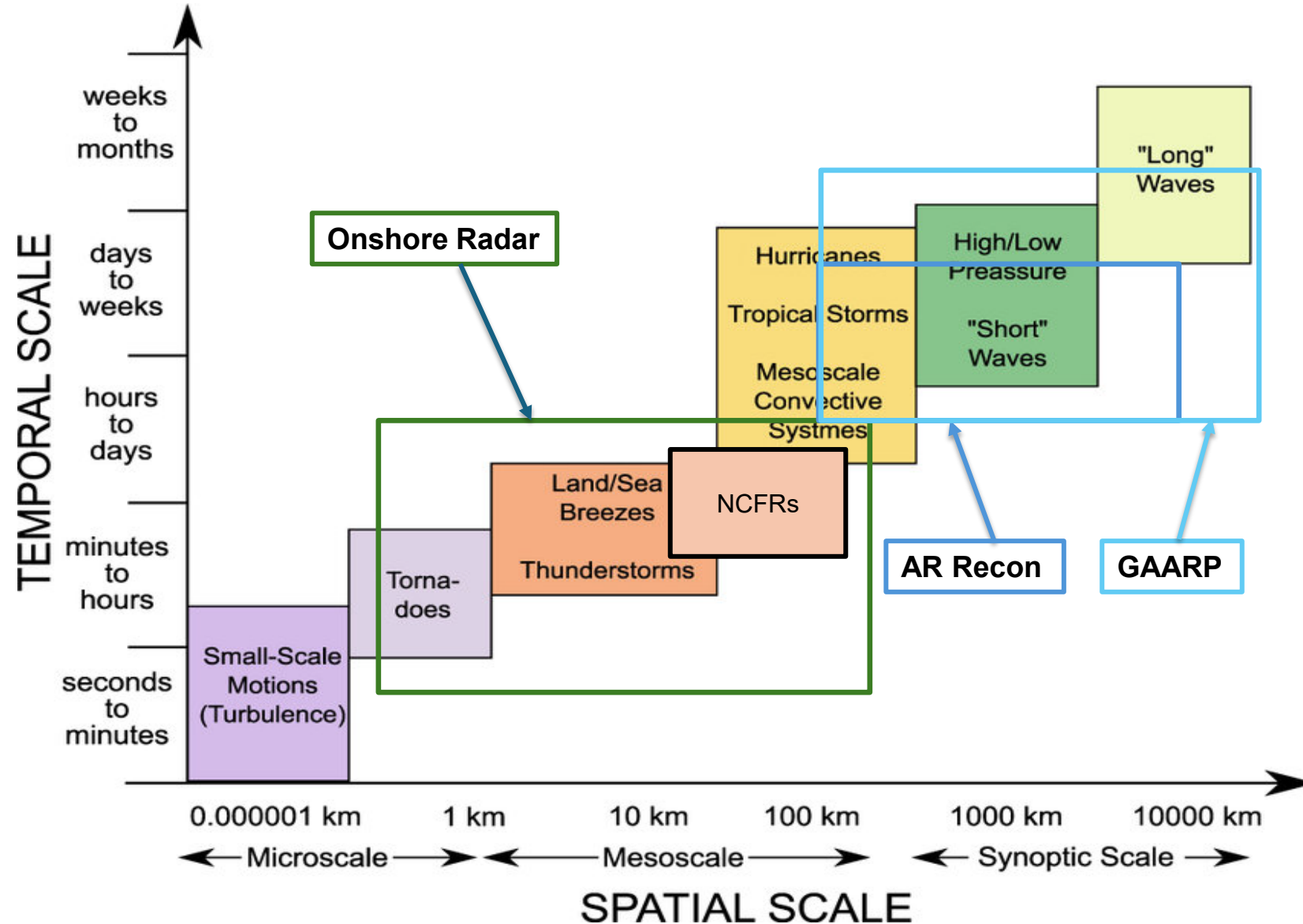
- Urban and small stream flooding
- Post-wildfire debris flows
- Strong winds and power outages



NCFRs, Recon, and Radar



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Proof of Concept: AQPI

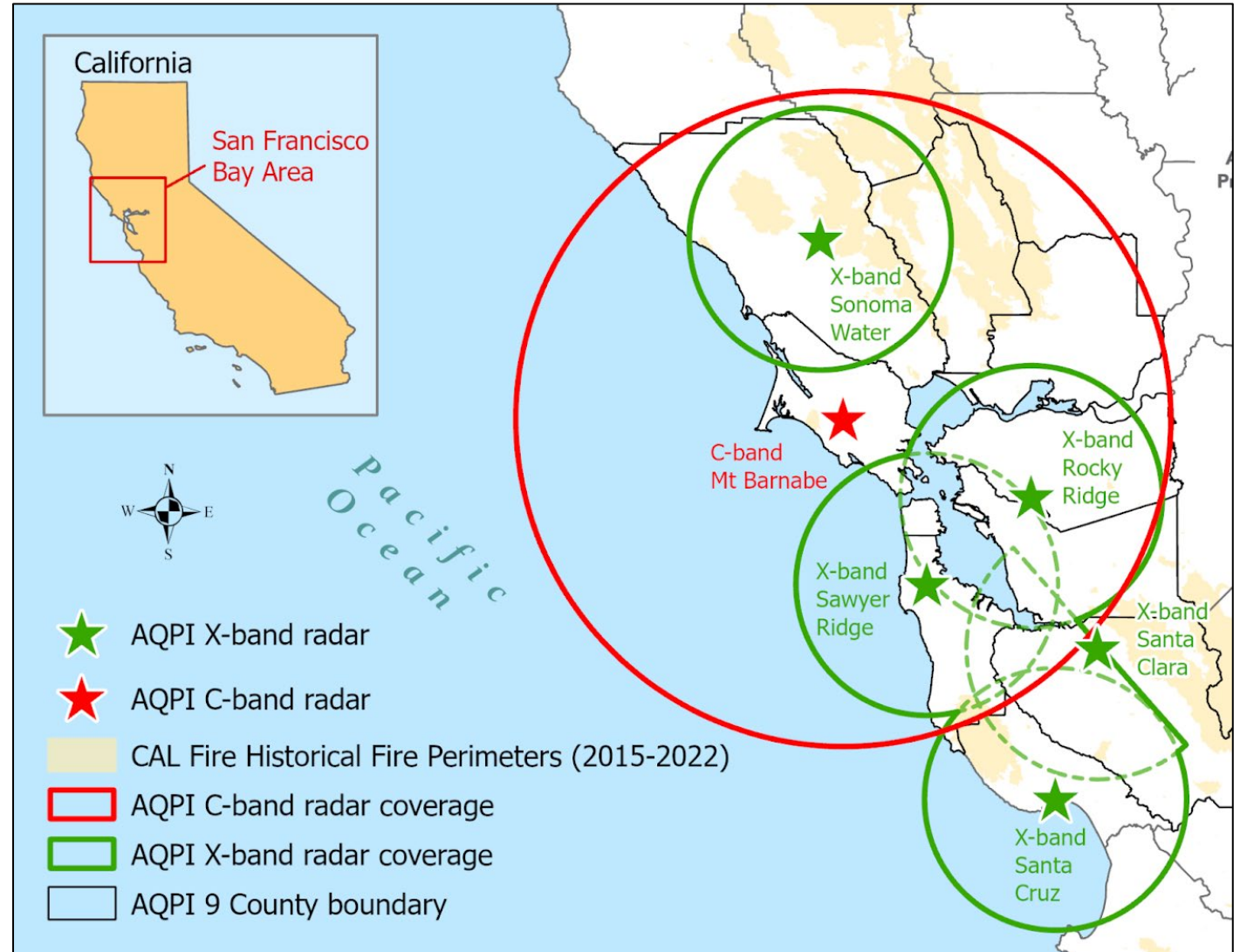


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The AQPI radar network, consisting of 5 X-bands and 1 C-band, is strategically designed to complement the existing NWS radar network by filling gaps in coverage and providing more accurate rainfall data in densely-populated areas.

It improves Bay Area radar quality in 3 primary ways:

- 1) Expanded radar coverage
- 2) Improved spatial resolution
- 3) Improved temporal resolution

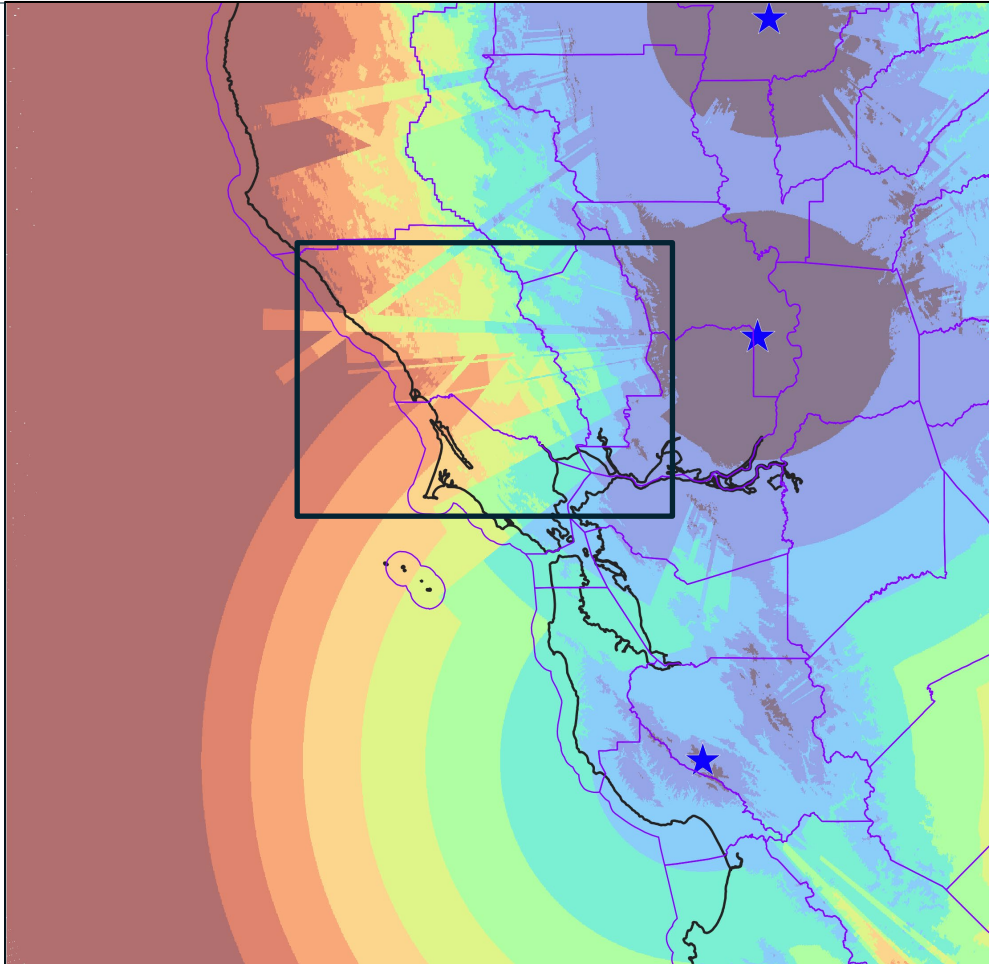


Proof of Concept: Before AQPI

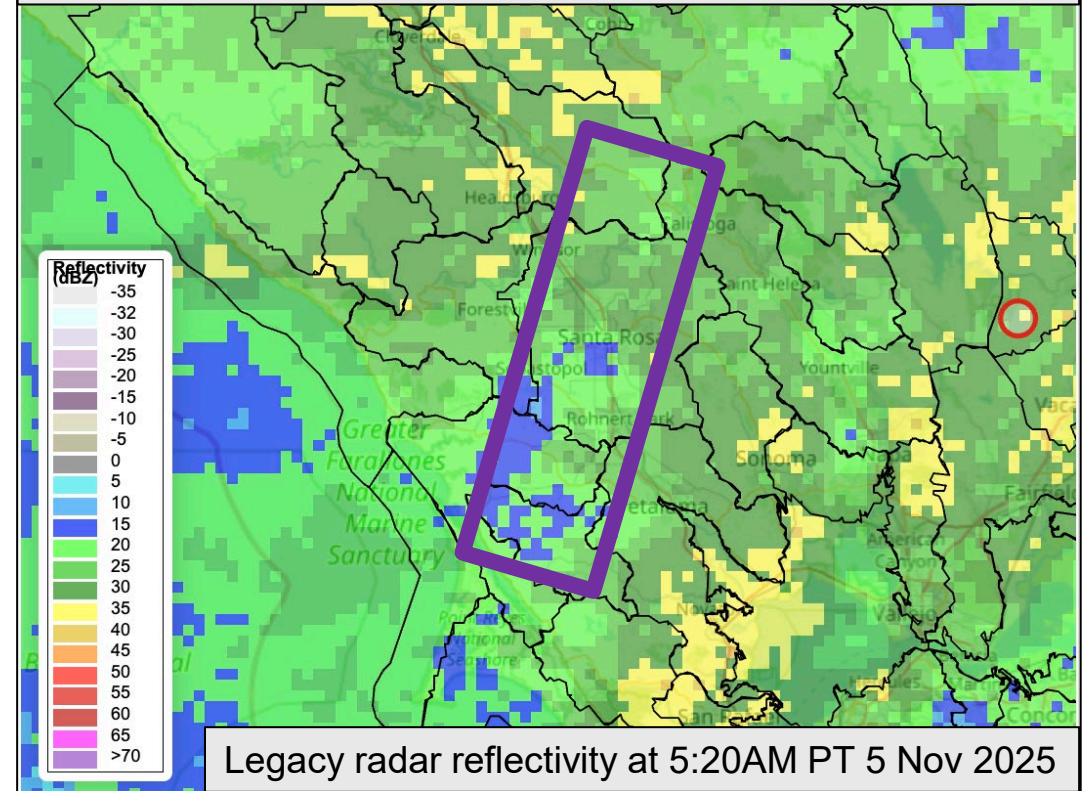


- ★ AQPI X-Band Radars
 - ★ AQPI C-Band Radar
 - ★ NEXRAD Radars
- AQPI Network Beam Height (m)

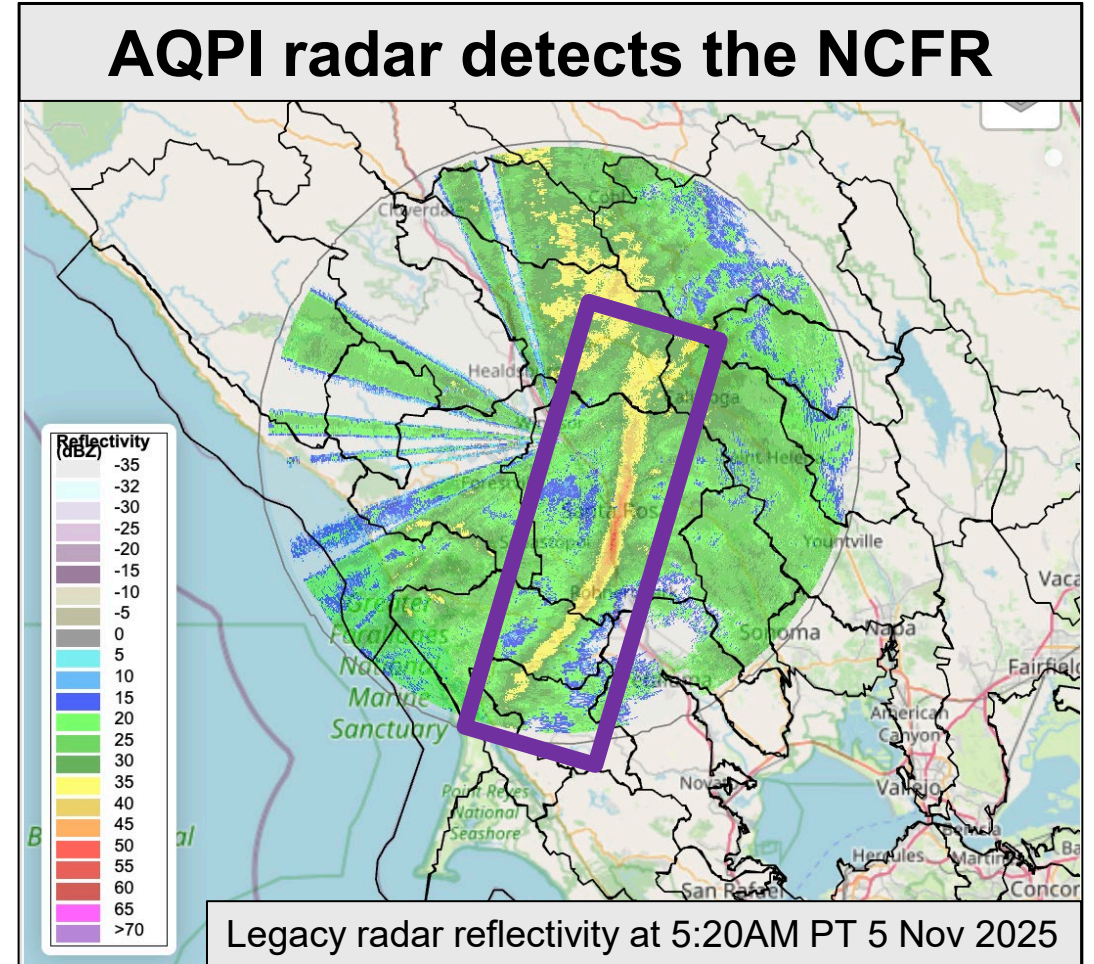
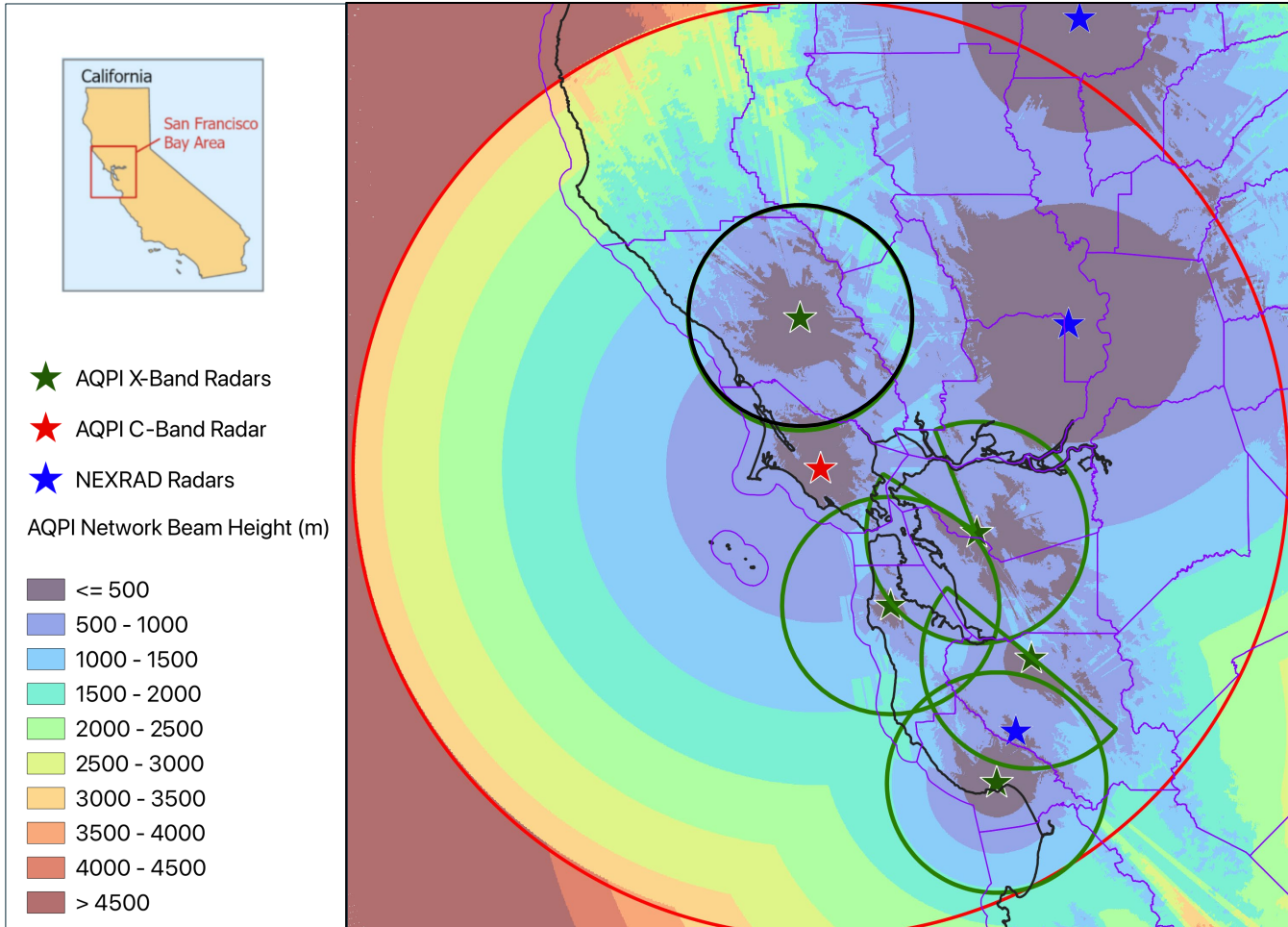
- ≤ 500
- 500 - 1000
- 1000 - 1500
- 1500 - 2000
- 2000 - 2500
- 2500 - 3000
- 3000 - 3500
- 3500 - 4000
- 4000 - 4500
- > 4500



Legacy (NWS) radar *does not* detect the NCFR

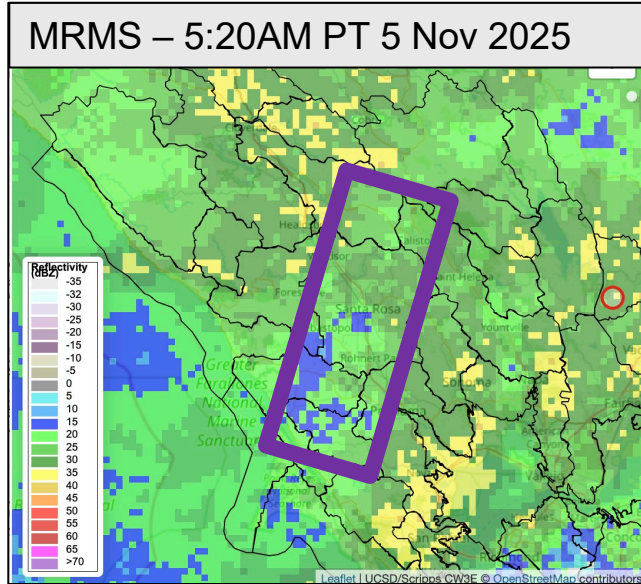
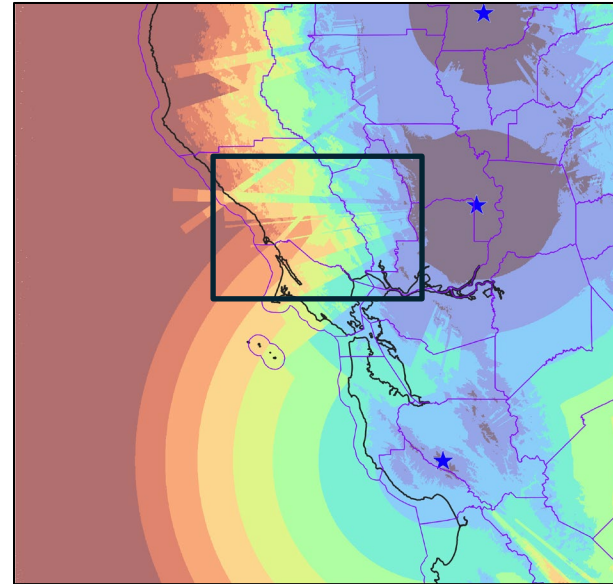


Proof of Concept: After AQPI

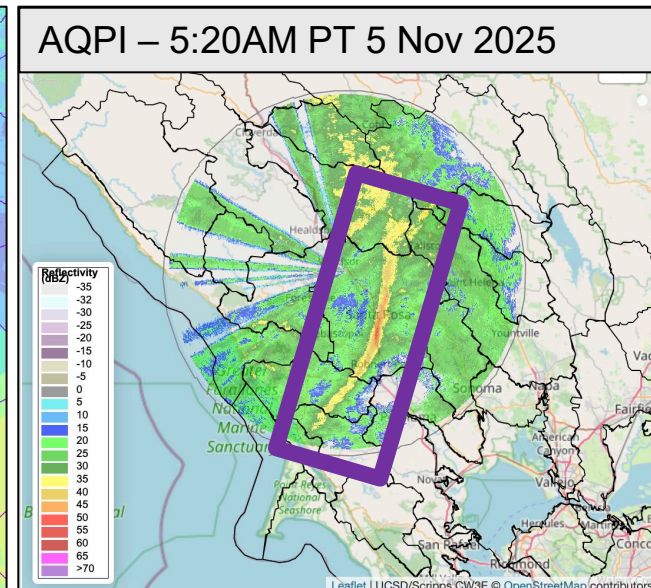
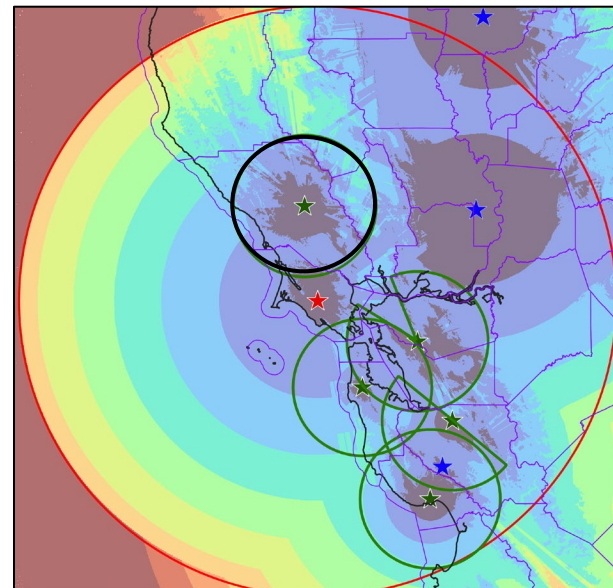
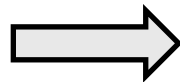


AQPI Detection of NCFRs

Legacy radar
does not detect
the NCFR



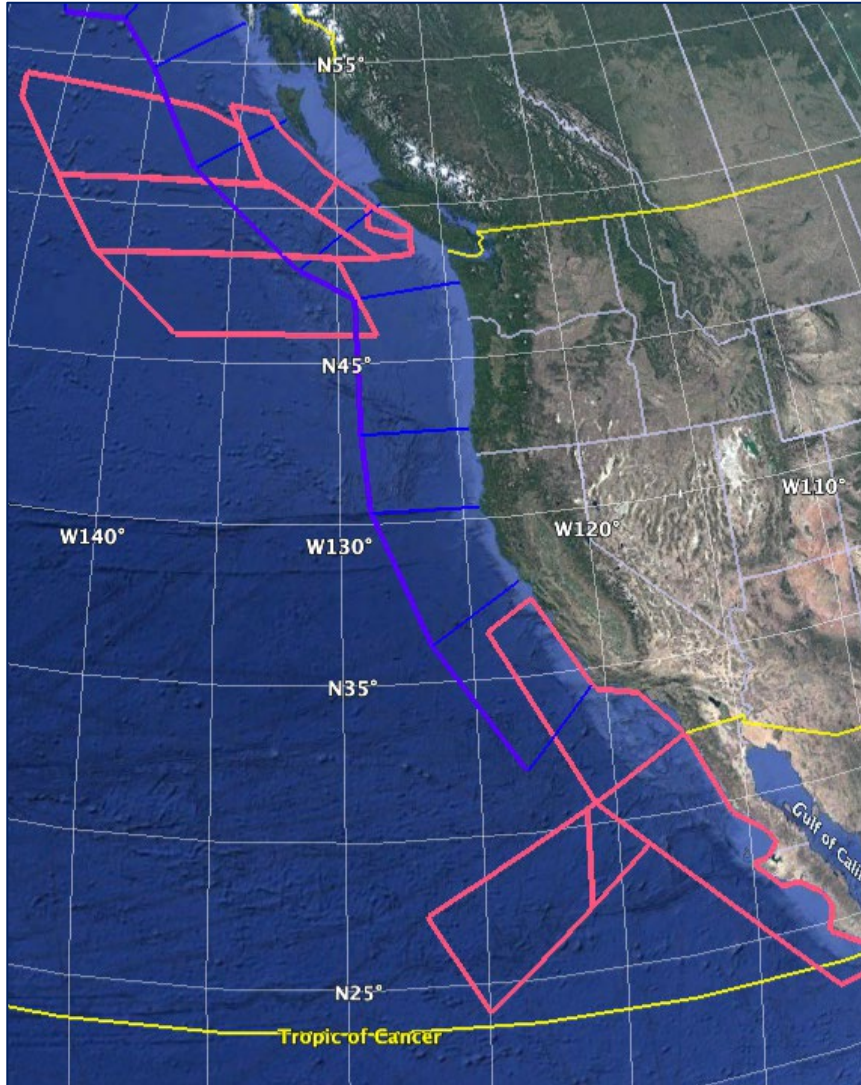
AQPI radar
detects the NCFR



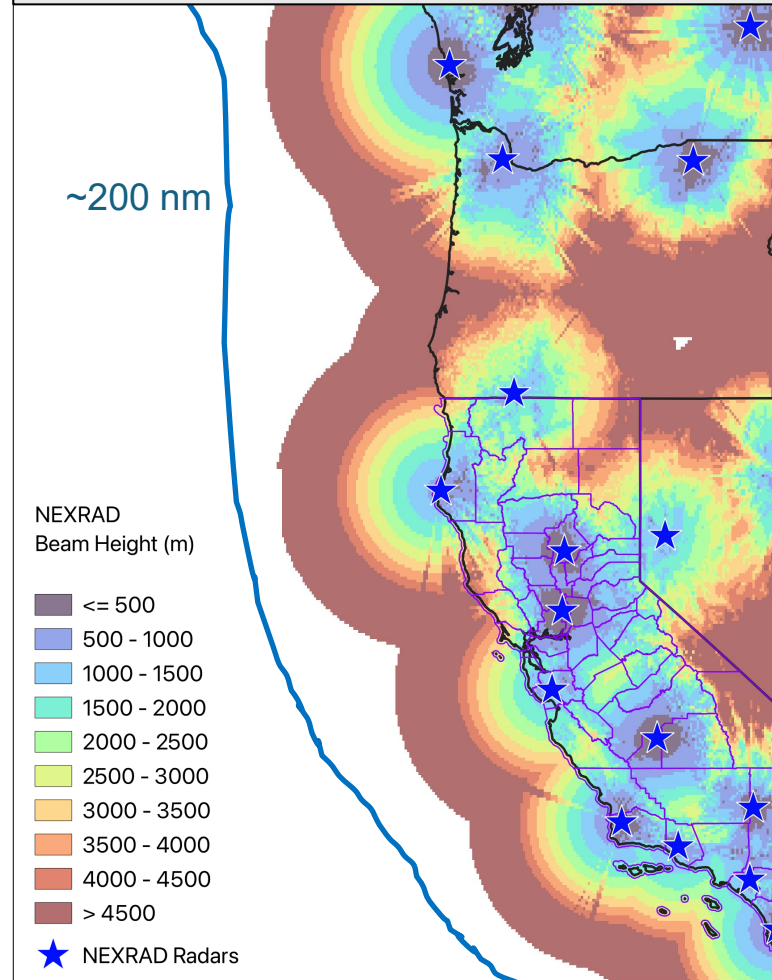
The "Final Mile"



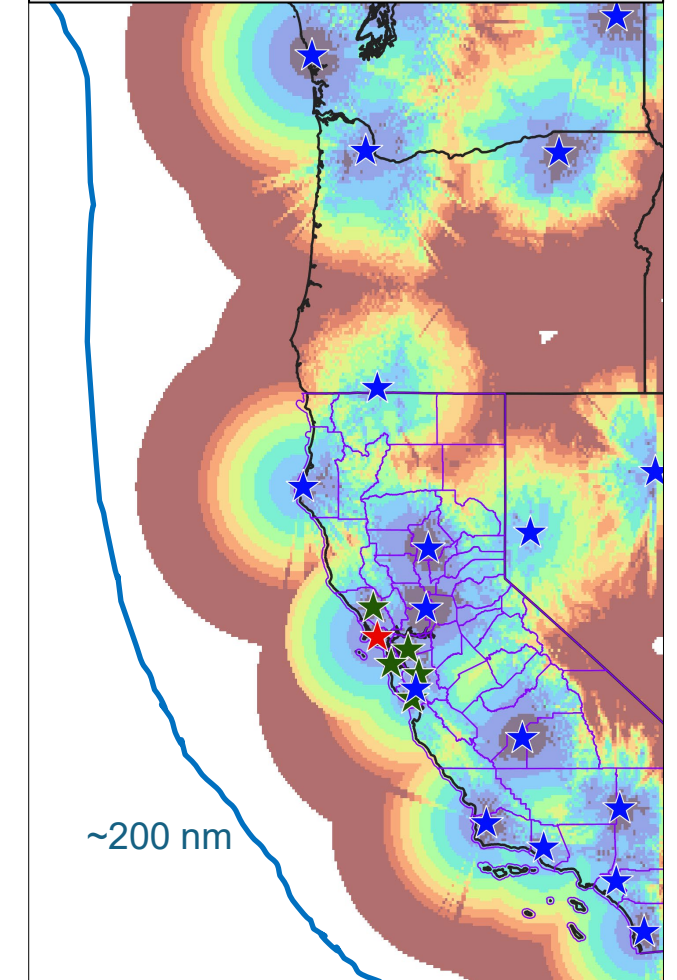
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Before AQPI



After AQPI



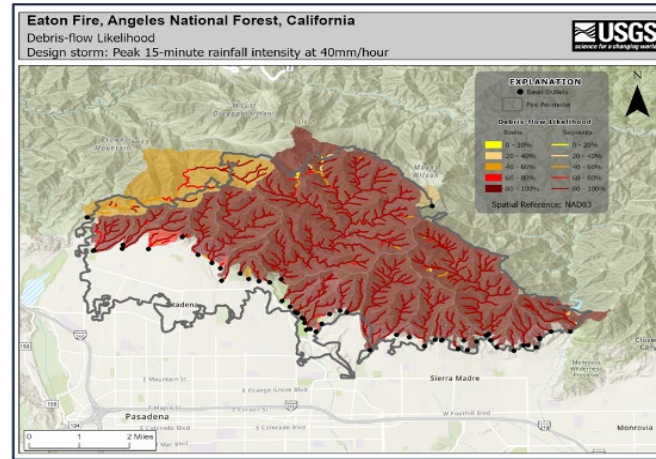
AQPI Hits the Road



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Southern CA Fires Jan 2025



USGS Debris Flow Thresholds



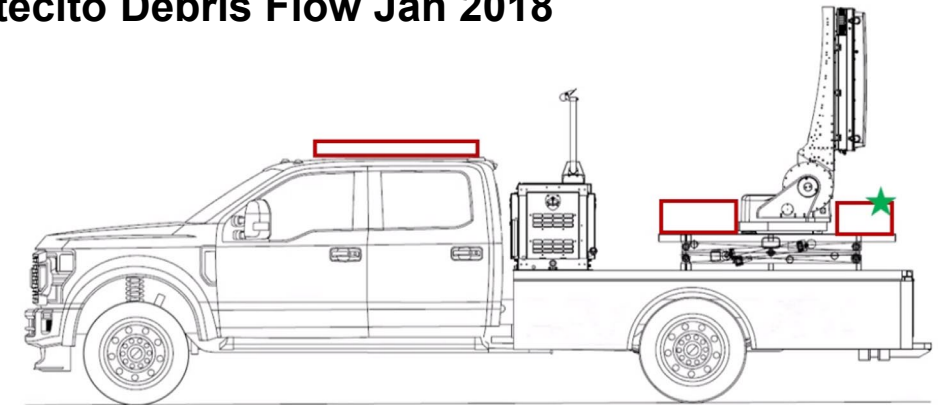
Montecito Debris Flow Jan 2018

Mobile and higher-res radar observations can contribute to better and faster alerts in these situations, and many others

RAPID-FIRE: Radar-based Precipitation Identification For Intense Rain and Extreme Impacts

Targeting Leads: J. Rutz | J. Houser

Overarching Goal: Demonstrate the value of mobile and higher-resolution radar observations in urban environments, complex terrain, and hazard-prone areas.



Concept for Skyler 3 Radar Truck (still being built). Courtesy of Jana Houser, The Ohio State University.





Within the overarching goal of demonstrating the value of mobile and higher-resolution radar observations, we have more specific goals for Winter 2026/2027:

- Extended on-station period (Dec-Feb) in Southern California
 - Roughly split between Los Angeles and San Diego metro areas
- 6-10 IOPs
- Leverage AR Recon forecast discussions for planning and coordinate with AR Recon IOPs
- Observe the following phenomena
 - Intense precipitation rates associated with NCFRs, orographic precipitation, and convective processes, especially upstream of and over hazards such as burn areas
 - Fluctuations in freezing level height over reservoir catchment areas during landfalling ARs
 - Microphysics data for use in model validation/verification studies

Summary



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- AR Recon has made great strides, but a “no Recon” zone stretches ~200 nm offshore. This area is partly observed by the NEXRAD radar network.
- An array of higher-resolution radars would help bridge the gap in forecast lead time improvements between ~12+ hours and nowcasting onshore precipitation (i.e., the “**final mile**”).
- An array of *mobile* platforms working closely with AR Recon and deployed strategically could revolutionize mitigation of precipitation-based hazards within CA.





Atmospheric River Reconnaissance



Figure from Lavers et al. 2024
Concept by F M Ralph

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More Information on AQPI

CW3E AQPI Webpage:
<https://cw3e.ucsd.edu/aqpi/>