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Rainfall estimation over the San Francisco Bay Area: a new system to infuse microphysical information into QPE

Monday 17 March 2025 12:00 (15 minutes)

Accurate rainfall estimation in regions with complex terrain, such as the San Francisco Bay Area, poses unique challenges. This region, like much of the western United States, is strongly influenced by atmospheric rivers (ARs), narrow corridors of intense water vapor transport that significantly impact coastal and mountainous regions. The present-day routine Z-R estimation is inadequate to capture the microphysics in ARs and hence results in inaccurate quantitative precipitation estimation (QPE). The Advanced Quantitative Precipitation Information (AQPI) system, a regional initiative, employs enhanced weather radar technology to track AR-associated precipitation with high precision, with a key goal of recording microphysical features. The AQPI system supplements the large-scale coverage of the WSR-88D network with additional, locally deployed X-band and C-band radars, enhancing the accuracy of weather monitoring, forecasting, and emergency response across the Bay Area.

This study utilizes the AQPI system's hybrid, multi-frequency radar network to improve rainfall estimation accuracy in this complex topographic environment. Key technical advancements in the AQPI system facilitate use of microphysical signatures into the QPE products and include networked calibration and enhanced radar visibility adjustments suited for complex terrain. Additionally, ongoing physical refinements are set to further improve rainfall accuracy. These include corrections for the Vertical Profile of Reflectivity (VPR) and tuning of the rainfall relationship based on microphysics and dual-polarization measurements, preventing contamination from ice.

These enhancements collectively aim to improve the precision of hydrological forecasting, providing critical insights for effective water resource management and flood mitigation efforts in the Bay Area.

Session

From Classical to Integrated Remote Sensing: New observation strategies for clouds and precipitation (multi-frequency, spectral polarimetry, multi-sensor)

Preferred Contribution Type

Oral Presentation

VAT

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