A CONUS Extreme Precipitation Event Database Derived from MRMS

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The Contiguous U.S. (CONUS) has experienced various extreme precipitation events across the decades, yet a ground-based observation database which quantifies these events and captures their spatiotemporal evolution is presently unavailable. A novel CONUS extreme precipitation events database can support applications to hydrology, climate and weather, including precipitation process investigations, emergency management, and the evaluation and development of models and spaceborne observation retrievals. To address this gap, we use the Multi-Radar Multi-Sensor (MRMS) system to produce a CONUS extreme precipitation event database. The MRMS system provides a selection of high-resolution hydrometeorological products across CONUS (0.01°, 2-minute spatiotemporal resolution; 2014 - present), produced from polarimetric NEXRAD ground-based radars, rain gauges, and atmospheric model analyses. The rationale of this extreme event database is to account for the high variability of precipitation processes in space and time, which MRMS enables due to its ability to track the spatiotemporal evolution of CONUS precipitation systems, including phase (rain, snow), type (convective, stratiform), rate, and other parameters. Furthermore, MRMS provides a stable and uniform observation system which is necessary to develop an event database that can bridge in-depth and consistent process characterization from sub-hourly to daily timescales. The novelty of the database is the automatic detection of extreme events at the daily scale and subsequent detailed diagnosis at 2-minute resolution. The event database is a key verification-oriented element of a NOAA project to develop a new multi-decadal probabilistic CONUS-wide 2-km resolution surface precipitation dataset. This presentation highlights initial studies into extreme precipitation events with MRMS from the past decade (e.g., Texas Floods 2025, Oroville Dam 2017) and analyzes and compares key hydrological quantities (event accumulation, max daily intensity, and others) amongst events. Furthermore, studies into the automatic detection of extreme precipitation events in the MRMS record and uncertainty analyses are discussed.