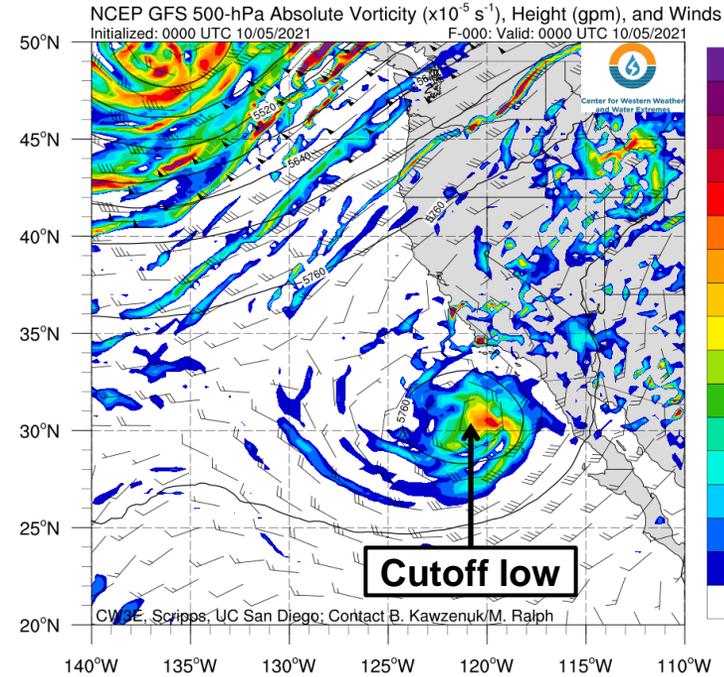


Rare October Thunderstorms Light Up Southern California

- Scattered thunderstorms produced heavy downpours and frequent lightning in Southern California during the evening of 4 Oct and early morning of 5 Oct
- The thunderstorms formed in a region of moist, unstable air, downstream of an upper-level cutoff low
- Many stations in western San Diego County received more than 0.50 inches of rain
- Lightning caused fires and scattered power outages throughout San Diego County

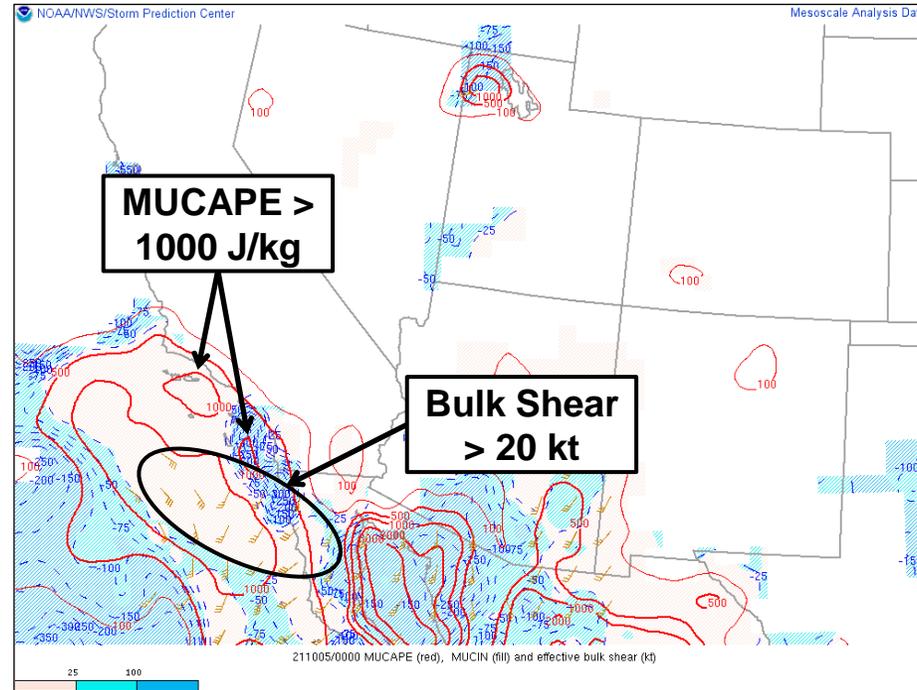
GFS 500-hPa Analysis

A) Valid: 5 PM PT 4 Oct



SPC Mesoscale Analysis

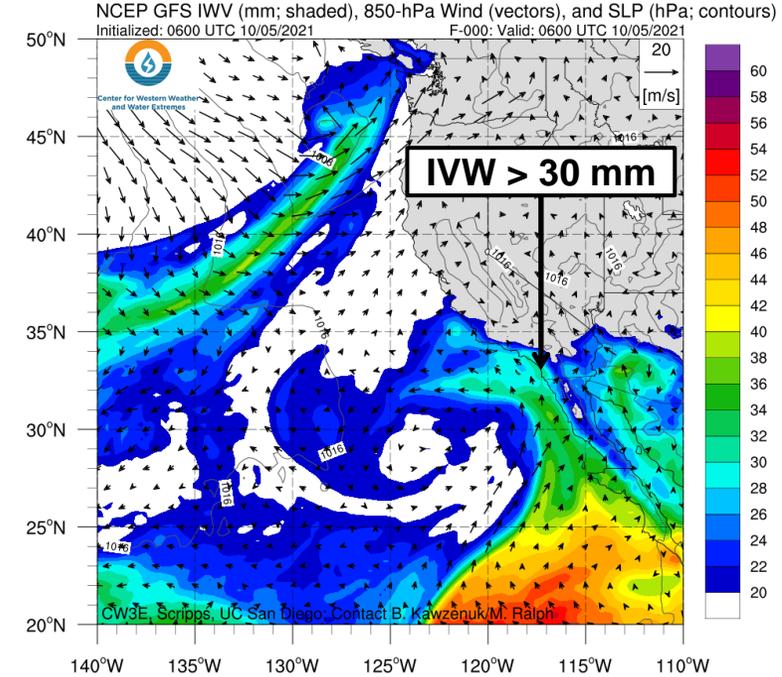
B) Valid: 5 PM PT 4 Oct



Source: NOAA/NWS/SPC, <https://www.spc.noaa.gov/>

GFS IWV Analysis

C) Valid: 11 PM PT 4 Oct



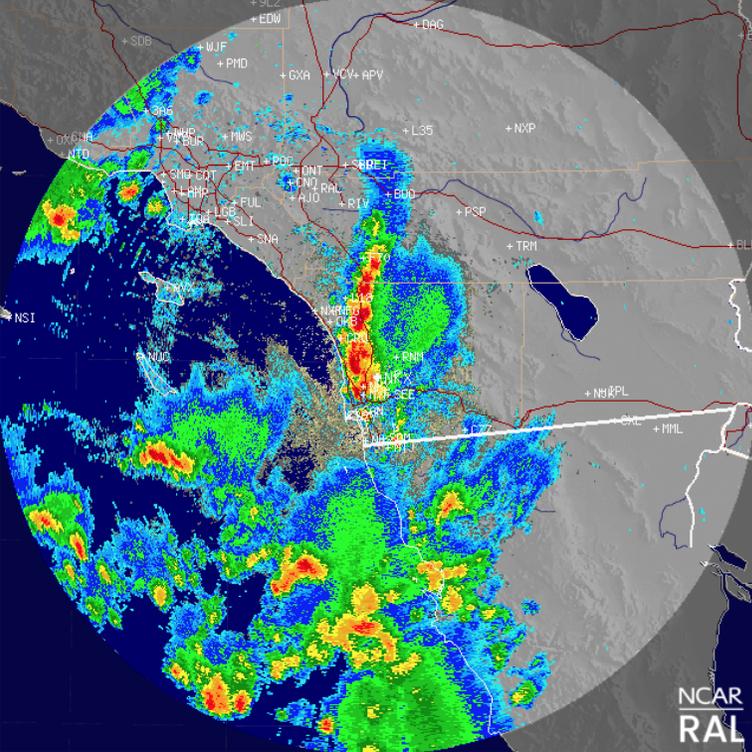
- The thunderstorms formed east of a weak 500-hPa cutoff low, in a region favorable for synoptic-scale ascent via differential cyclonic vorticity advection (Figure A)
- The initiation of thunderstorms was aided by the presence of unstable air (note the MUCAPE values > 1000 J/kg offshore) and vertical wind shear (approaching 20 kt near San Diego, CA; Figure B)
- Although the moisture transport was relatively weak, moist air wrapping around the east side of the cutoff low eventually spread over Southern California (Figure C)

Event Summary: 4–5 Oct 2021

For California DWR's AR Program

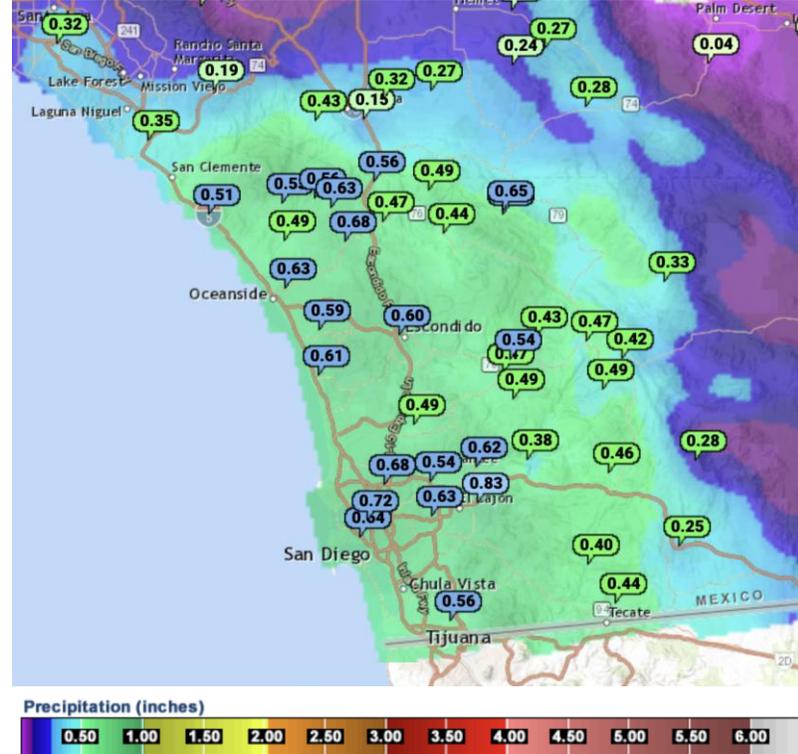
NEXRAD Composite Reflectivity

KNKX San Diego, CA/Miramar NAS 02:00:00 UTC Tue 05 October 2021
 NEXRAD Level II Composite reflectivity: max in column (c) UCAR <http://weather.rap.ucar.edu/radar/>



Source: NCAR RAL, <https://ral.ucar.edu/>

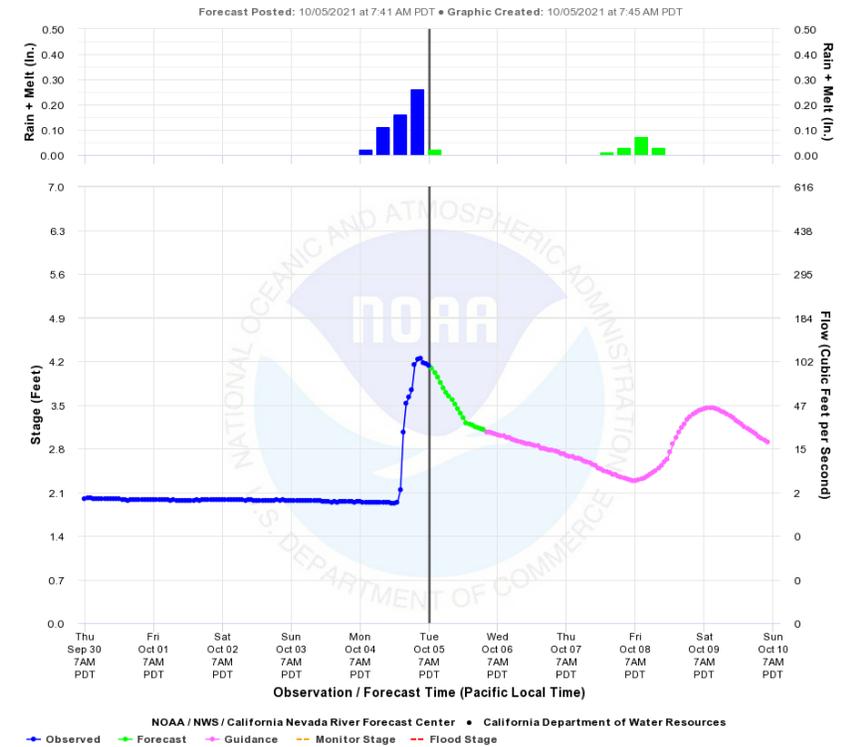
CNRFC 24-h QPE Valid: 5 AM PT 4–5 Oct



Source: NOAA/NWS CNRFC, <https://cnrfc.noaa.gov/>

San Diego River at Fashion Valley

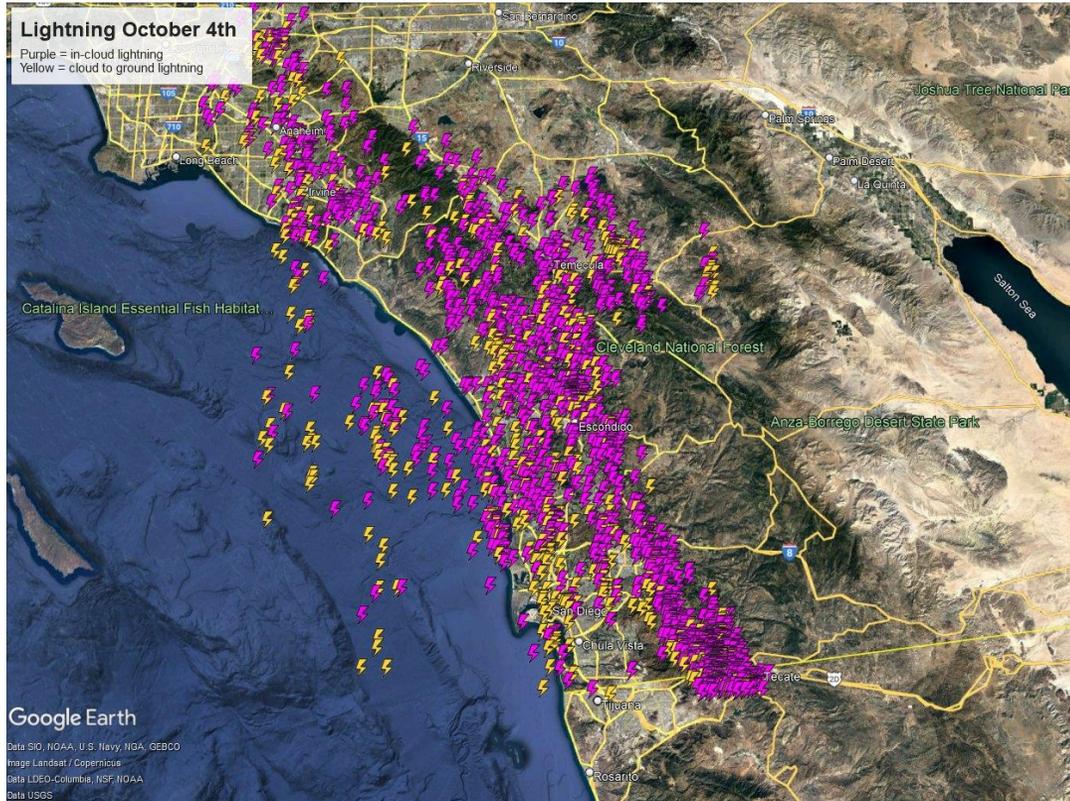
San Diego River - Fashion Valley (FSNC1)
River Forecast Plot



Source: NOAA/NWS CNRFC, <https://cnrfc.noaa.gov/>

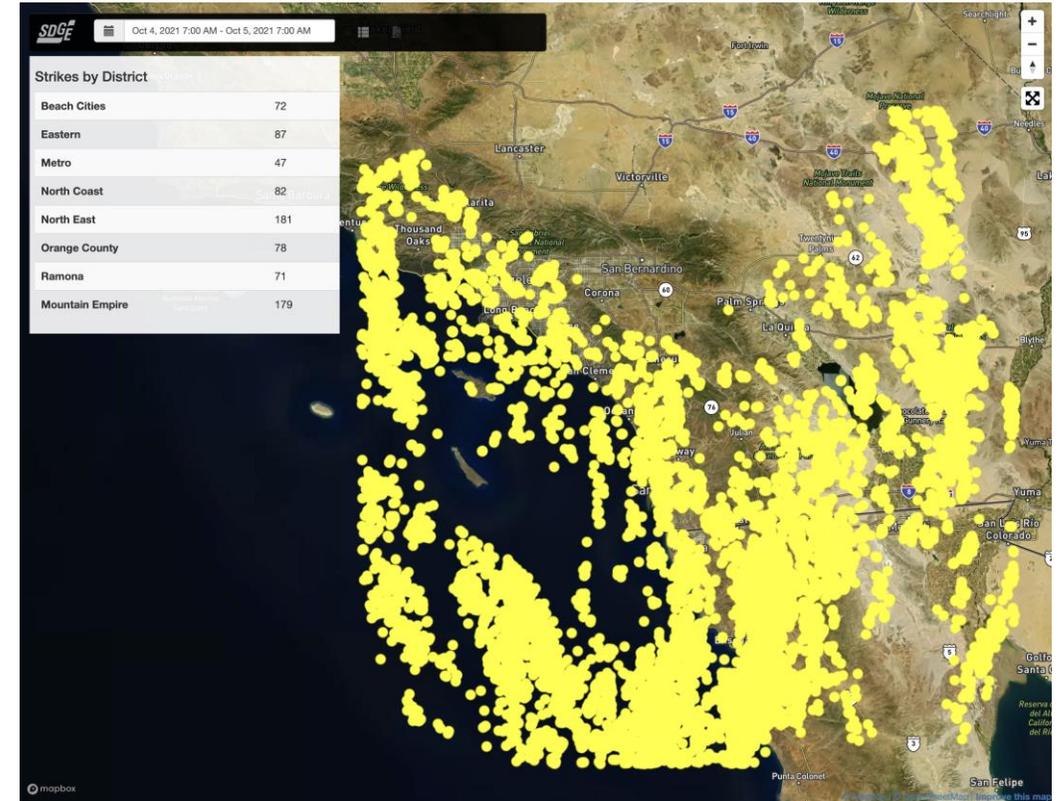
- The KNKX radar loop shows scattered thunderstorms initiating south of San Diego during the late afternoon on 4 Oct
- As time progressed, the thunderstorms grew in spatial coverage and became more organized, especially over San Diego County, where a quasi-linear structure was briefly observed
- The heaviest rainfall occurred in western San Diego County, with many stations reporting more than 0.50 inches
- Intense rainfall triggered a rapid streamflow response on the San Diego River (at Fashion Valley), but dry antecedent soil conditions and low baseline flow prevented any flooding

Observed Lightning Strikes: 4 Oct 2021



Source: NWS WFO San Diego, <https://weather.gov/sgx/>

SDGE Lightning Tool



Source: Chris Arends, SDGE, <https://lightning.sdgeweather.com/>

- Numerous cloud-to-ground (CG) lightning strikes were observed across Southern California during 4–5 Oct
- According to NWS San Diego, more than 500 CG lightning strikes were detected in San Diego County during the 24-hour period ending 7 AM PT 5 Oct
- San Diego Gas & Electric (SDGE) reported nearly 800 lightning strikes within its service area during the same time period
- Lightning caused tree and building fires, as well as thousands of power outages in San Diego County (source: NBC 7 San Diego)