

CW3E Event Summary: 9–11 September 2022

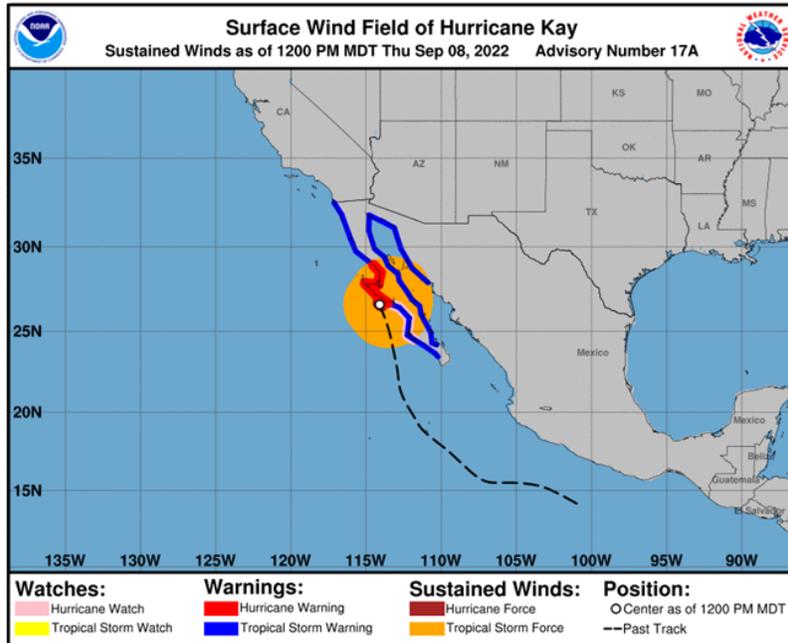
Rare Tropical Cyclone Brings Heavy Rain and Strong Winds to Southern California

- Tropical Storm Kay and its remnants produced heavy rain and high winds across portions of Southern and Central California during 9–11 September
- Some locations in the San Diego County mountains recorded more than 4 inches of rain on 9 September. Wind gusts of over 100 miles per hour were also recorded
- Precipitable water observed during this event in San Diego was 2.35 inches, the 3rd highest during the period of record and the highest value observed during the month of September
- Heavy precipitation over desert areas resulted in roadway flooding, debris flows, and rockslides which caused prolonged roadway closures in multiple locations
- High winds forced multiple school districts to cancel school due to hazardous conditions
- Power outages for more than 60,000 customers were reported across Southern California
- Heavy rain helped to bring the Fairview and Radford fires under control. As of the morning of 13 September, Inciweb was reporting 62% and 67% containment, respectively.

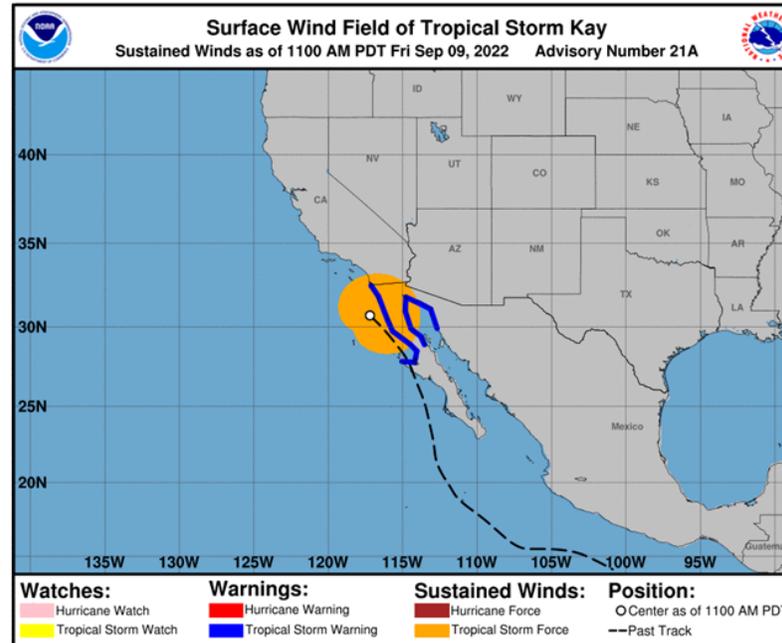
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Surface Winds and Advisories

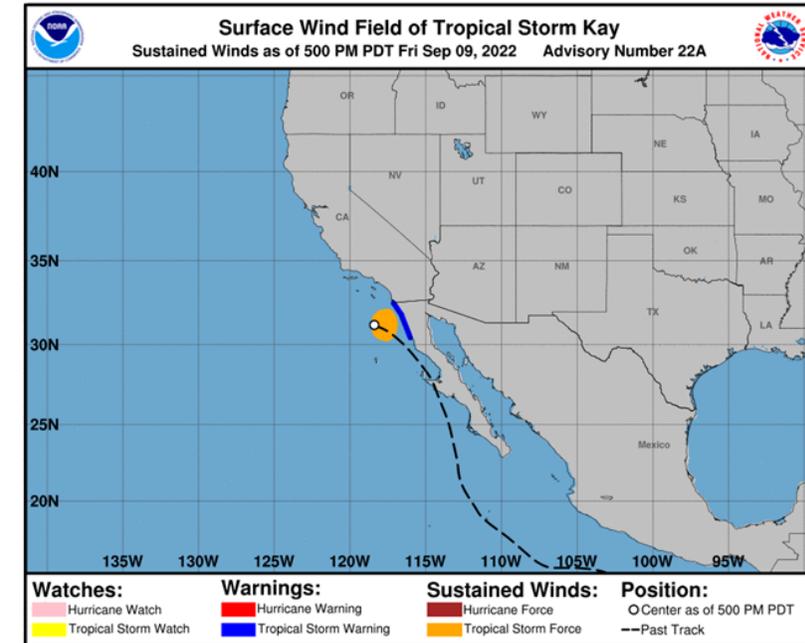
(A) Valid: 12 PM MDT 8 Sep (Analysis)



(B) Valid: 11 AM PDT 9 Sep (Analysis)



(C) Valid: 5 PM PDT 9 Sep (Analysis)

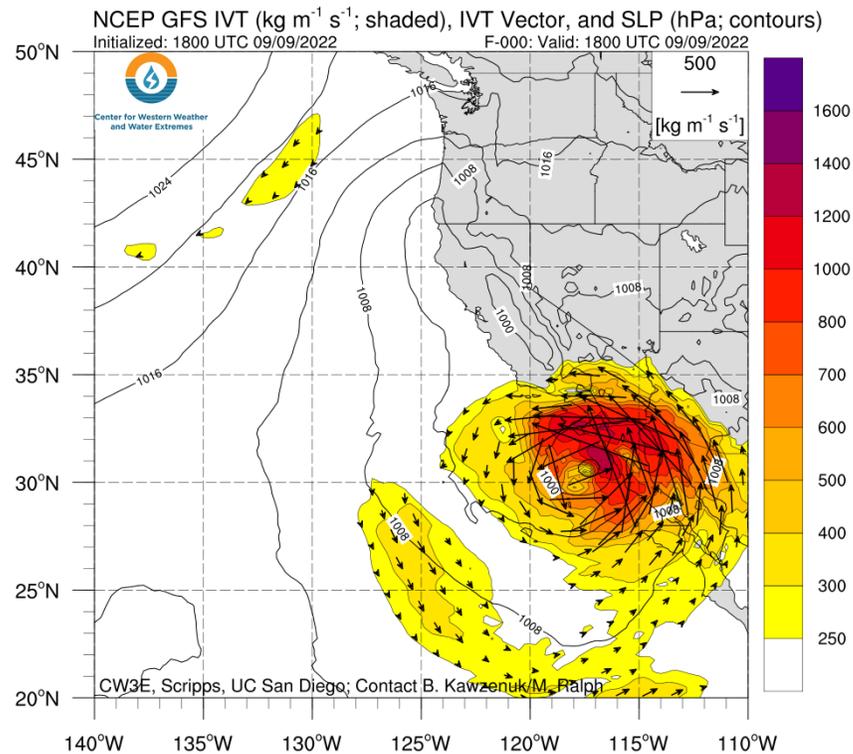


- Kay made landfall as a Category 1 hurricane in Baja California, Mexico, near Bahia Asuncion, on 8 September with maximum sustained winds of 75 mph (Figure A)
- Shortly after landfall, Hurricane Kay weakened to a tropical storm with maximum sustained winds between 39–74 mph
- The cyclone then moved Northwest along the Baja Peninsula before turning west out to sea and dissipating (Fig B and C)
- According to AccuWeather, Kay made the closest approach to Southern California from the Pacific in the last 50 years, coming as close as 130 miles from San Diego

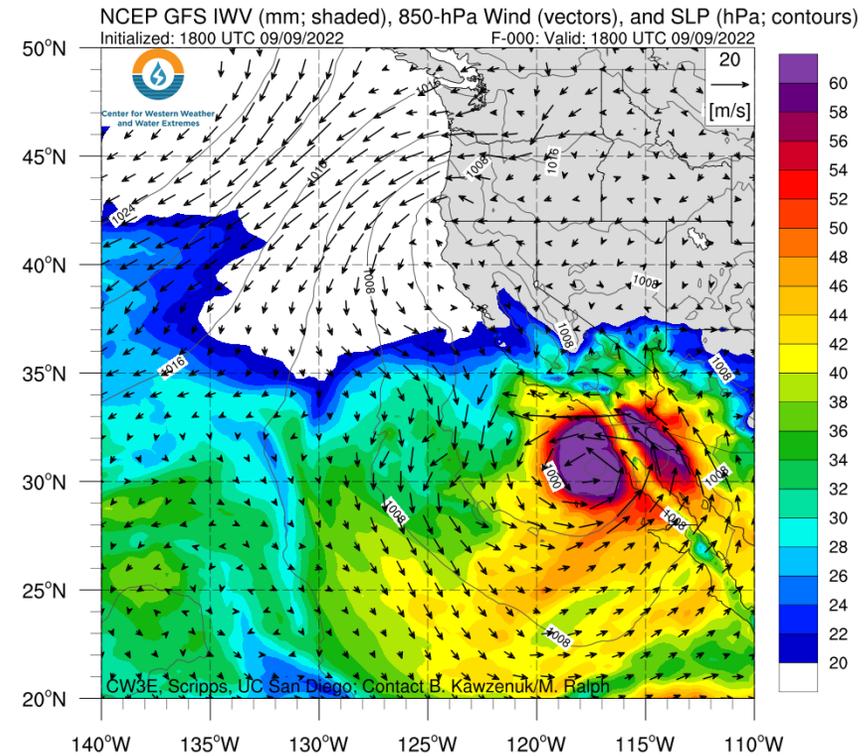
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GEFS IVT and IWV Analysis

(A) Valid: 11 AM PDT 9 Sep 2022



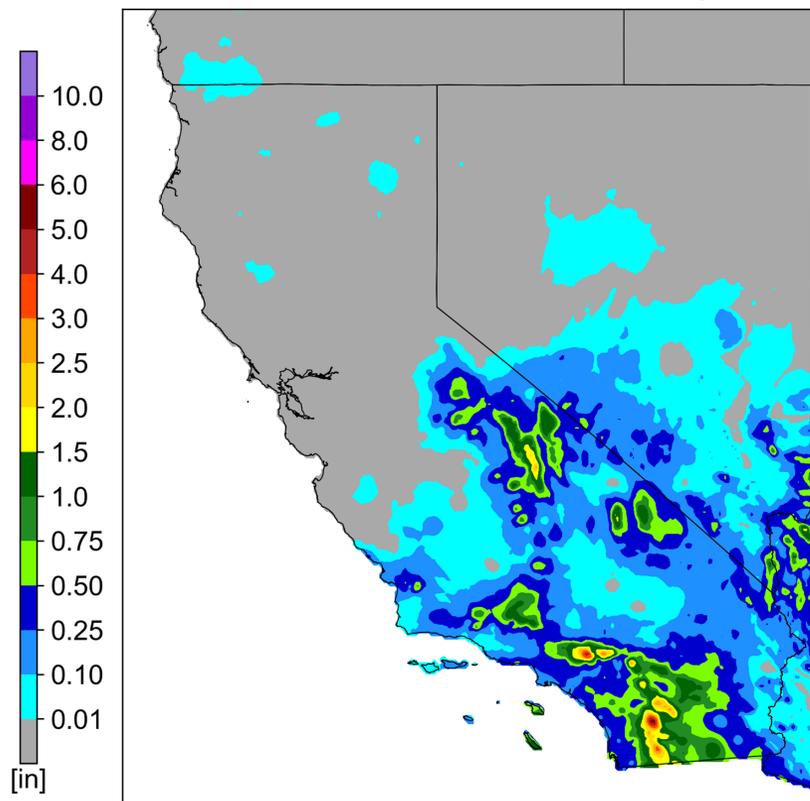
(B) Valid: 11 AM PDT 9 Sep 2022



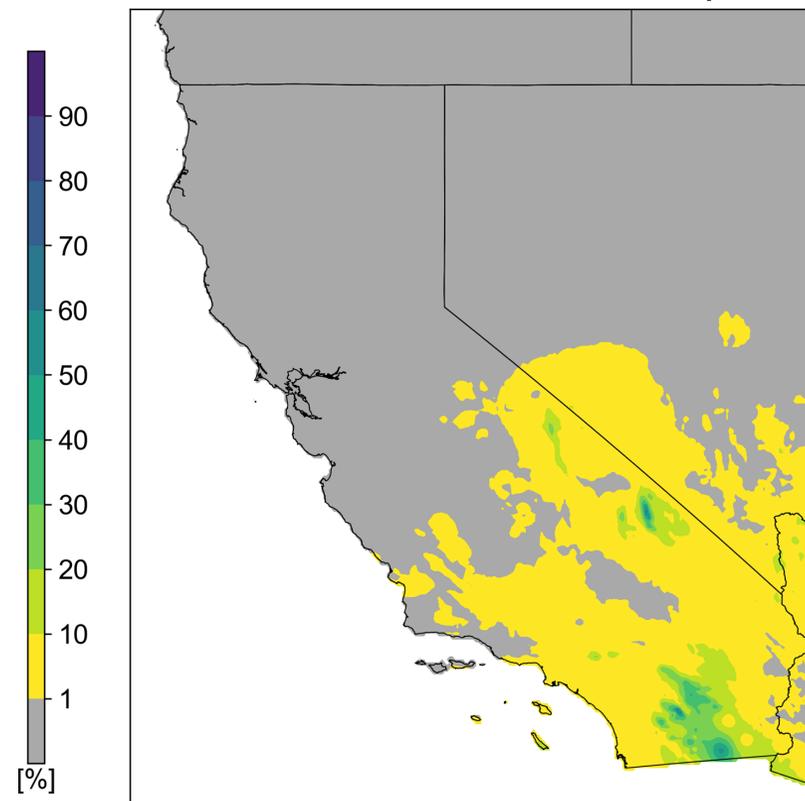
- Tropical Storm Kay brought IVT values $> 800 \text{ kg/m/s}$ throughout most of far Southern California (Figure A)
- The cyclone also brought IWV values $> 60 \text{ mm}$ to Imperial County, CA. Southeasterly flow in this part of the cyclone favored upslope moisture flux on the east side of the Laguna Mountains. Therefore, most of the hydrologic impacts were confined to the mountains and deserts (Figure B).

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NCEP Stage IV 24-h QPE
Valid 5 AM PDT 9–12 Sep



Percent of Normal WY Precipitation
Valid 5 AM PDT 9–12 Sep

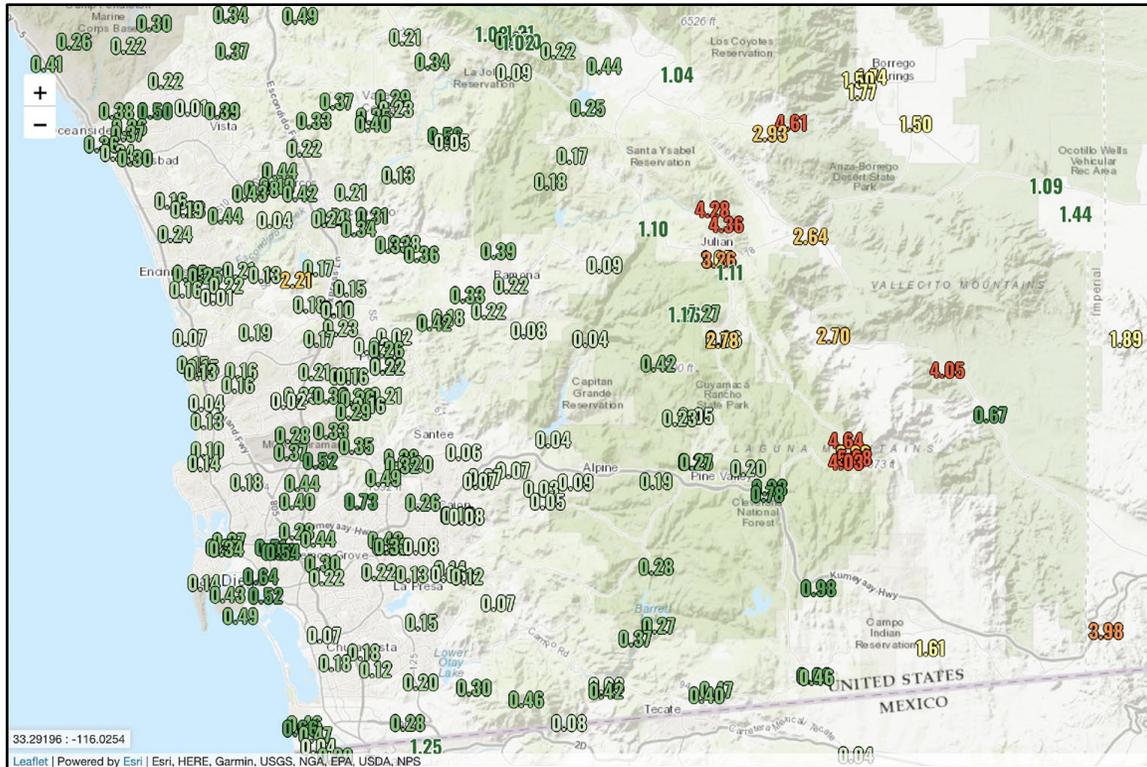


- Tropical Storm Kay and its remnants produced heavy rainfall across portions of Southern and Central California during 9–11 Sep
- An estimated 2–5 inches of total rain fell in the Peninsular Ranges and eastern Transverse Ranges
- Lighter amounts (0.5–2 inches) were observed in portions of the Sonoran Desert, as well as the Southern Sierra Nevada, the White Mountains, and the Panamint and Amargosa Ranges near Death Valley
- Some locations received 30–60% of the average total water year (WY) precipitation from this event

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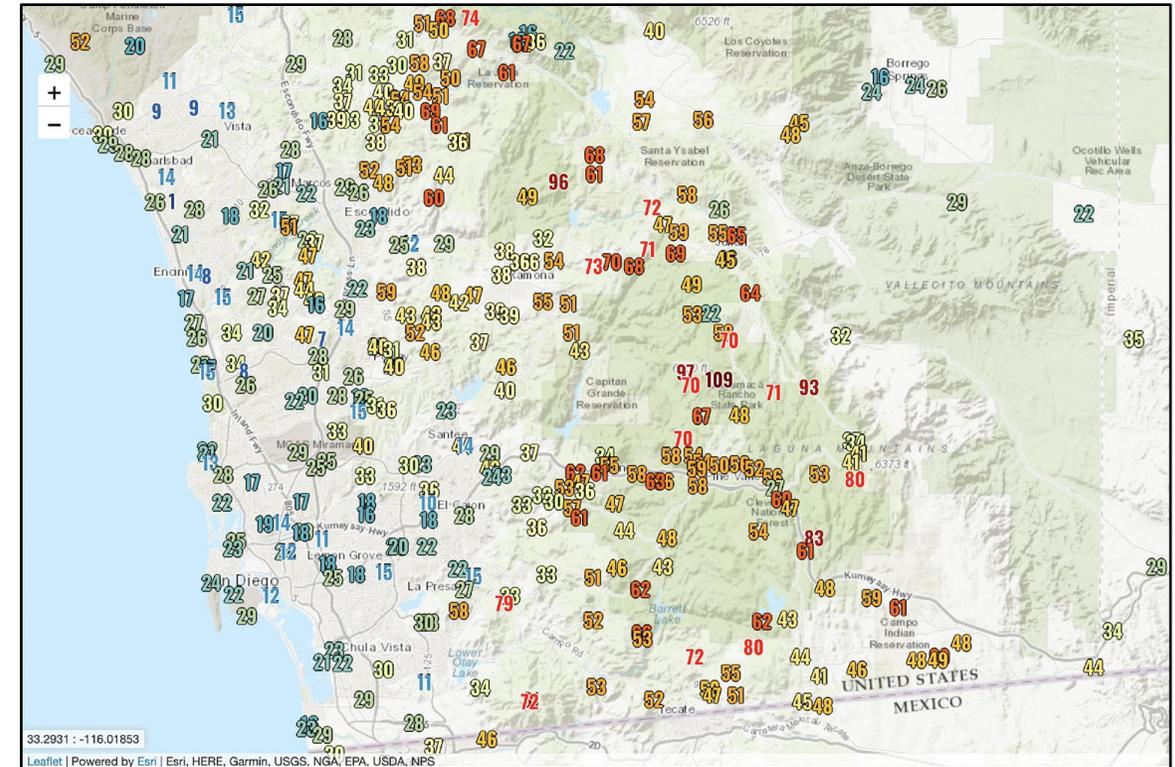
Observed 24-h Precipitation

Valid 12 AM PDT 9 Sep – 12 AM PDT 10 Sep



Maximum 24-h Wind Gust

Valid 11:59 PM PDT 9 Sep



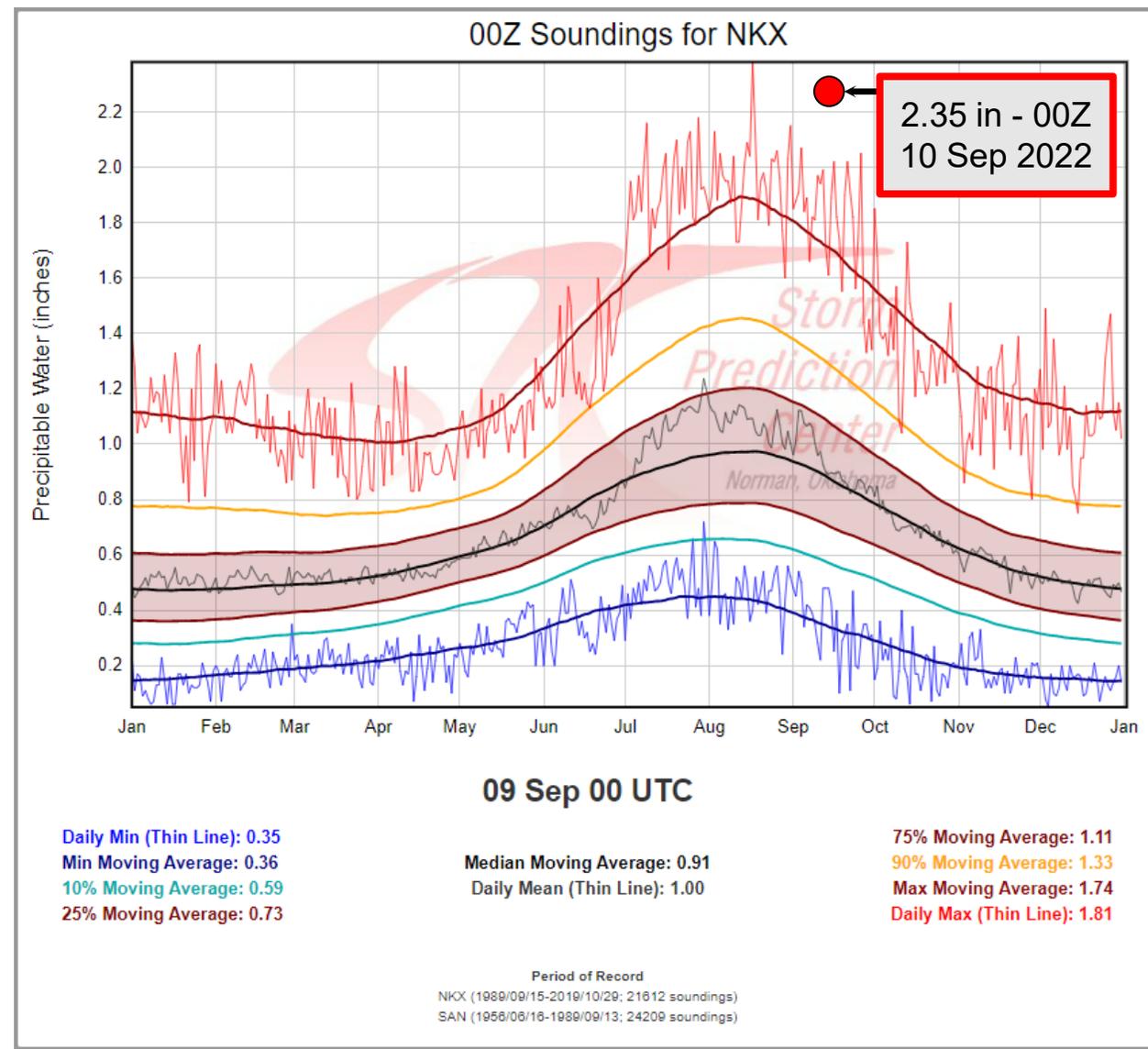
Source: NWS Western Region Headquarters

- The heaviest rainfall occurred on 9 Sep, with several stations in the San Diego County mountains recording daily rainfall > 4 inches
- Daily rainfall records were shattered at many locations, including Lake Cuyamaca (2.03 inches), Borrego (1.45 inches), Thermal (0.81 inches), Campo (0.66 inches), and San Diego International Airport (0.63 inches)
- Hurricane-force wind gusts were also observed in the San Diego County mountains during the morning of 9 Sep
- Notable peak wind gusts: Cuyamaca Peak - 109 mph, Sill Hill (SDGE) - 97 mph, Big Black Mountain - 96 mph

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Record Breaking Precipitable Water

- The sounding from MCAS Miramar (San Diego) at 00Z 10 September (5 PM PDT 9 Sep) recorded a precipitable water (PWAT) measurement of 2.35 in
- This measurement is the highest observed PWAT measurement during the month of September
- It is also the 3rd highest PWAT measurement at MCAS Miramar (San Diego) since records began in 1956



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

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Landslide on SR 190 in Death Valley National Park - Towne Pass, CA
Source: <https://twitter.com/TheKuntaMC/status/1568975118042562560>



Damaged highway in northern Baja California Sur, Mexico
Source: <https://twitter.com/AStiller0/status/1568332015304581120>



Downed trees are removed in San Diego County
Source: <https://twitter.com/SanDiegoCounty/status/156836305578509313>

Flooding

- Impacts included submerged roadways, washed out lanes, and debris flows encroaching on highways
- NWS San Diego received multiple reports of debris flows in San Diego, Riverside, and San Bernardino Counties
- Flooding and debris flows resulted in multiple roadway closures for prolonged periods

High Winds

- Peak wind gust of 109 mph along Cuyamaca Peak, 96 mph on Big Black Mountain (NWS LSRs)
- Multiple school districts in eastern San Diego County were forced to close due to high winds, citing hazardous travel conditions and downed trees
- Wind damage was reported in eastern San Diego County, with reports of limbs snapped and trees down