USCRN and Heavy Precipitation: Intensity, Duration, and Location Govern Impacts

The U.S. Climate Reference Network (USCRN) station located near La Junta, Colorado, experienced a notable extreme precipitation event on September 22 2015 starting at 5:45 PM MDT (Figure 1). A total of 3.87 inches (98.4 mm) of precipitation fell in 70 minutes, with 3.85 inches (97.9 mm) falling in one 60-minute period (Figure 2). According to the NOAA 14 Atlas Point Precipitation Frequency Estimates data server, a 60-minute precipitation event of this size would typically only occur once every 750 years at this location. The largest 15-minute and 30-minute totals within the event each had return intervals of 150 and 200 years, respectively. The peak wind gust during the event was 50 mph (22.3 meters per second) at the height of the precipitation gauge opening (5 feet or 1.5 meters above the ground). Interestingly, during this windy event the co-located tipping bucket precipitation gauge collected only 83% as much as the primary weighing precipitation gauge, indicating the superiority of weighing gauges liked used by the USCRN for detecting extreme precipitation events.

This event near La Junta was certainly noteworthy for its intensity, but it did not last long, and it had relatively little impact on the rolling grasslands in the area. Another precipitation event of recent interest occurred at Sitka, AK, on August 18 2015 that was not quite as intense or as large in total as the La Junta event, but had more deadly consequences. A total of 2.95 inches of rain (74.9 mm) fell at the USCRN station in less than 6 hours, an event with a return interval of only about 35 years. The most intense hour of the storm yielded 0.82 inches (20.9 mm), typical of a 20 year return interval. However, these rains fell on already saturated steep slopes above Sitka during a wetter-than-normal month, and released several earthflows and landslides, including one that crushed a home and killed three people (Figure 3). This slide occurred just after the hour when the most intense rain rates occurred. It is important to note antecedent conditions and existing hazards when assessing whether storms of certain intensity and duration will impact a location mildly, moderately, or severely. Meanwhile, 5.04 inches (127.9 mm) of rain fell in Sitka on September 10, but no further landslides were released, as the rain was evenly distributed over a 24 hour period (Figure 4).

USCRN stations have a unique capability to study brief yet heavy rain events due to the 5-minute precipitation reporting intervals, excellent gauge shielding to reduce wind impacts on precipitation gathering, and use of a weighing bucket instrument with heaters so that precipitation is efficiently captured in all seasons. As USCRN precipitation time series continue to lengthen, these data will be used to trace climate change both in the mean amount of precipitation, but also in the distribution of precipitation event intensity, duration, and frequency.

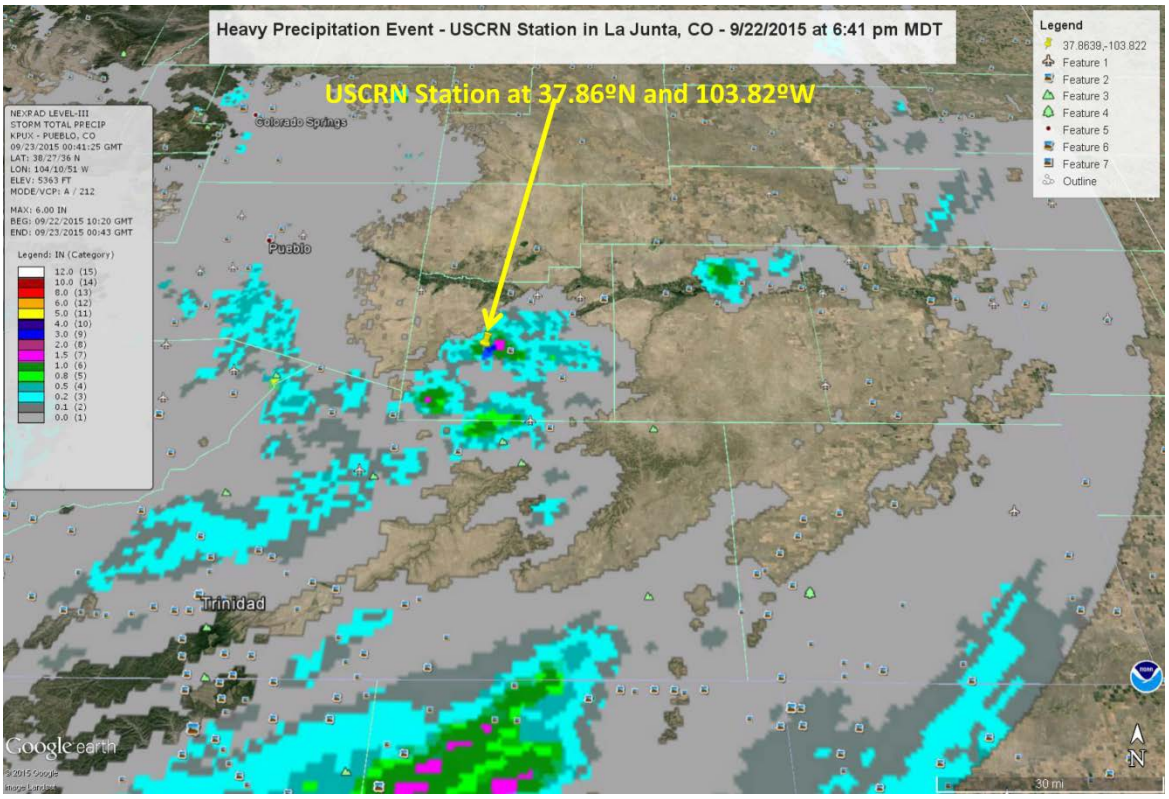
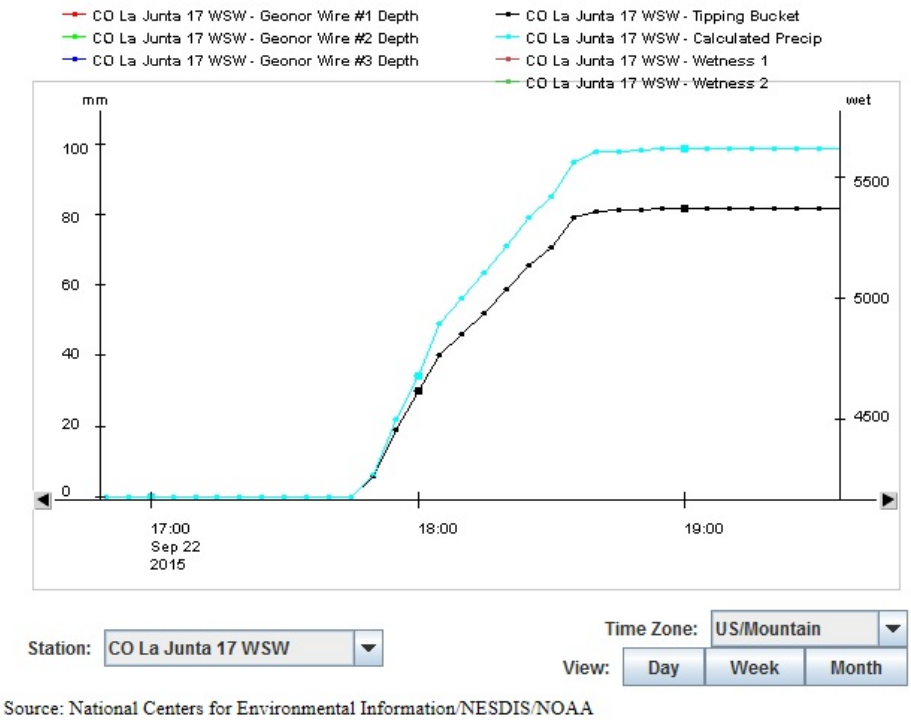


Figure 1. Local NWS radar during the September 22 2015 heavy precipitation event at La Junta.



Source: National Centers for Environmental Information/NESDIS/NOAA

Figure 2. Precipitation accumulation at the USCRN station near La Junta on September 22 2015. Blue is the accumulating weighing bucket gauge total, black is the tipping bucket gauge total.

Figure 3. Image of the deadly landslide path in Sitka on August 18 2015.

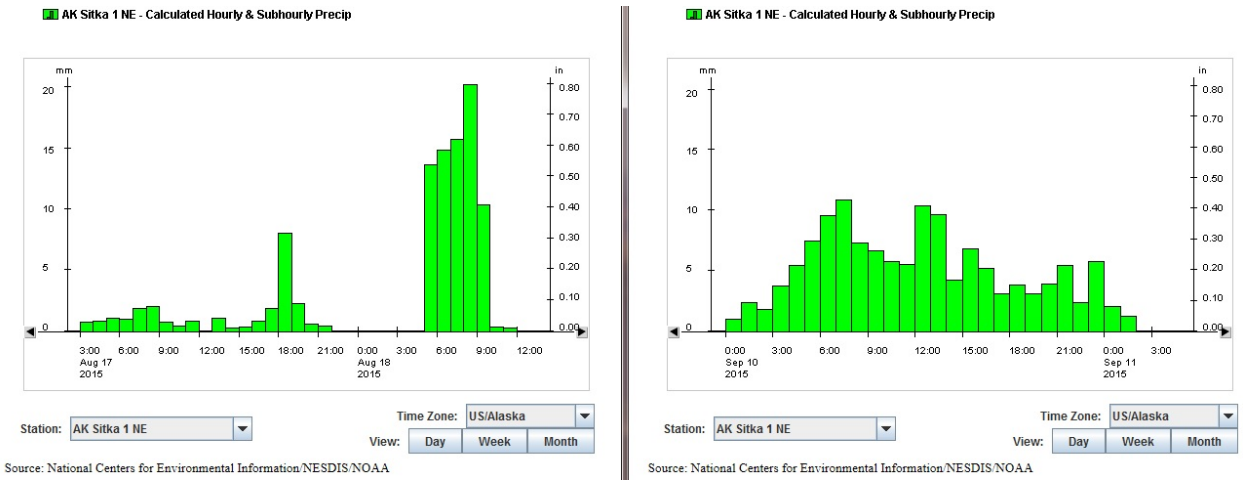


Figure 4. Comparison of USCRN hourly rain rates during the heavy rain event that triggered landslides in Sitka on August 18, 2015 (left) compared to a larger but less intense rain event on September 10 2015 (right). Each green bar represents the amount of rain falling in one hour.