**Analysis**

I compared 17 data points across 365 days occurring within the 2021 calendar year.

* Wind:
  + There were 58 days where Crime Reports and Average Daily Wind Speed (AWND) were both above the mean of 572.53, and 1.46 mph respectively (32%).
    - There were 111 days where they were below the mean.
  + There were 68 days where Crime Reports and Fastest 2-minute wind speed (WSF2) were both above the mean of 572.53, and 8.43 mph respectively (40%).
    - There were 101 days where both were below the mean.
  + There were 110 days where Crime Reports and Fastest 5-second wind speed (WSF5) were both above the mean of 572.53, and 12.86 mph respectively (65%).
    - There were 59 days where both were below the mean.
* Precipitation:
  + There were 6 days where Crime Reports and Precipitation (PRCP) were both above the mean of 572.53, and 0.04” respectively (3%).
    - There were 163 days where both were below the mean.
* Temperature:
  + There were 111 days where Crime Reports and Temperature Maximum (TMAX) were both above the mean of 572.53, and 74.49 F respectively (66%).
    - There were 58 days where both were below the mean.
  + There were 117 days where Crime Reports and Temperature Minimum (TMIN) were both above the mean of 572.53, and 56.66 F respectively (69%).
    - There were 52 days where both were below the mean.
* Weather Conditions:
  + There were 55 days where Crime Reports and Weather Conditions: Fog, Ice Fog, or Freezing Fog (WT01) were both above the mean of 572.53, and 0 respectively (32%).
    - There were 114 days where both were below the mean.
  + There were 5 days where Crime Reports and Weather Conditions: Heavy Fog or Heavy Freezing Fog (WT02) were both above the mean of 572.53, and 0 respectively (3%).
    - There were 164 days where both were below the mean.
* Space Weather Events:
  + There were 41 days where Crime Reports were above the mean of 572.53 and a Solar Flare occurred (24%).
    - There were 128 days were Crime Reports were below the mean, and there were no Solar Flares.
  + There were 3 days where Crime Reports were above the mean of 572.53 and a Geomagnetic Storm occurred (1%).
    - There were 166 days were Crime Reports were below the mean, and there were no Geomagnetic Storms.
  + There were 139 days where Crime Reports were above the mean of 572.53 and a Coronal Mass Ejection occurred (82%).
    - There were 30 days were Crime Reports were below the mean, and there were no Coronal Mass Ejections.

Data correlations:

Fastest 5-second Wind speed (WSF5), Temperature Maximum and Minimum (TMAX, TMIN), and Coronal Mass Ejections (CME) present a compelling argument that there is a correlation between these events and a rise in crime reported to the Los Angeles Police Department during the 2021 calendar year.

* 110 of 169 (or 65%) of the days where crime reports were above the mean, also occurred when the daily fastest 5-second wind speed (WSF5) exceeded the mean.
* 111 of 169 (or 66%) of the days where crime reports were above the mean, also occurred when the daily temperature maximum (TMAX) exceeded the mean.
* 117 of 169 (or 69%) of the days where crime reports were above the mean, also occurred when the daily temperature minimum (TMIN) exceeded the mean.
* 139 of 169 (or 82%) of the days where crime reports were above the mean, also occurred when a coronal mass ejection (CME) happened.

Coronal Mass Ejections (CMEs) are giant clouds of plasma emanating from the Sun with embedded magnetic fields which are released into space following a solar eruption [1]. These events can affect planetary magnetic fields and produce disturbances that can short-circuit electronics, power grids, or endanger astronauts currently in orbit. While our atmosphere generally protects us from these affects, a paper by Roger Henderson, reveals that there may be a correlation. Dr. Vieira of Harvard University discovered a correlation between excess heart attack deaths in years with high solar activity, and further studied an additional 800 men during intense solar disturbances concluding that they exhibited an increase in stress [3]. The data acquired from data source # 3, specifically on Coronal Mass Ejections (CMEs) indicates a rise in crime reports that aligns with a CME 82% of the time.

A 2001 study by Craig Anderson at Iowa State University, presented the “heat hypothesis” which postulates that hot temperatures may increase aggressive motivations and behaviors [2]. His study for the ISU Department of Psychology revealed there were consistent positive associations between heat and aggression. Their findings revealed that a 2 F increase in average temperature equated to approximately 9 additional murders or assaults per 100,000 people, or roughly 24,000 additional murders or assaults per year in the United States (population 270 million at the time of the study). This study supports the hypothesis and data acquired from data source # 2, where TMAX and TMIN above the mean aligned with a rise of Crime Reports between 66-69% of the time.

Fastest 5-second wind speed (WSF5) gusts, were also aligned with an increase in crime reports 65% of the time. This appears to be an anomaly as Average Daily Wind and Fastest 2-minute wind speed were not indicative of an increase in crime.

Average Daily Wind Speed (AWND), Fastest 2-minute wind speed (WSF2), precipitation (PRCP), Weather Conditions (WT01, WT02), Solar Flares (FLR), and Geomagnetic Storms (GST) do not present a strong indication that there is a correlation between these events and a rise in crime reported to the Los Angeles Police Department during the 2021 Calendar year. For the 7 data points described above, the statistical comparison of Crime Reports and a weather event both occurring above their mean value do not exceed 40% of the total crime reports above the daily mean.

**Conclusions**

This project aimed to answer the hypotheses: Does weather affect crime? Is there a specific type of weather event that correlates to an increase in crime reports more than another? Are there any types of weather events that do not have a strong effect on an increase in crime reports? This project was a massive undertaking to address such a question on behalf of Angelinos like myself. There are conclusive statistical anomalies where temperatures and coronal mass ejections appear to have a direct correlation to an increase in crime reports within Los Angeles, CA for the calendar year of 2021. This supports the documented evidence from various researchers that heat yields an increase in aggression and CMEs affect stress levels in men [1, 2, 3].

**Observations**

The data points that do not support the hypothesis (AWND, WSF2, PRCP, WT01, WT02), may have been an inaccurate reflection of true affect on an increase in crime reports. Data solely focused on Los Angeles, CA in the 2021 calendar year. This geographic area is not known for high-wind, precipitation, or fog. A more accurate depiction of the impact of those data sets on crime reports may call for a multi-city approach where those weather events are more common, such as Pensacola, FL (rain fall), Seatle, WA (fog), or Chicago, IL (wind).

The data sets were only collected for the 2021 calendar year, during the COVID-19 pandemic. It is unclear if the pandemic and subsequent restrictions/lockdowns may have had an impact on crime independent of ground or space weather conditions. A wider scope beyond the COVID-19 pandemic could eliminate any concerns of confirmation bias in the conclusions provided above.

Data source # 1, is a .csv acquired from NOAA which can be supplemented with additional weather for other cities and encompass a wider date range. Data source # 2, was scraped from LAPD’s crime statistic website, but could easily be modified to accept crime data from other municipalities and cover a broader date range. Lastly, Data source # 3, was gathered using NASAs public API, which can easily be adjusted to accommodate a more expansive time-range.

References

[1] <https://www.nasa.gov/feature/goddard/2021/five-questions-about-space-weather-and-its-effects-on-earth-answered>

[2] Anderson, Craig A. "Heat and violence." *Current directions in psychological science* 10.1 (2001): 33-38.

[3] https://doi.org/10.1080/14432471.2022.2129819

[4] https://www.ncei.noaa.gov/pub/data/cdo/documentation/LCD\_documentation.pdf (NOAA Weather Acronym descriptions)

[5] https://www.nasa.gov/mission\_pages/sunearth/news/classify-flares.html (NASA documentation on classification of Solar Flares)

[6] https://svs.gsfc.nasa.gov/10109 (NASA documentation of Solar Flare scale)

[7] https://www.swpc.noaa.gov/products/planetary-k-index (NOAA documentation of Geomagnetic Storms)

[8] https://www.ncei.noaa.gov/cdo-web/search

[9] https://data.lacity.org/Public-Safety/Crime-Data-from-2020-to-Present/2nrs-mtv8/explore/query/SELECT%20%60date\_occ%60%2C%20count%28%60date\_occ%60%29%20AS%20%60count\_date\_occ%60%0AWHERE%0A%20%20%60date\_occ%60%0A%20%20%20%20BETWEEN%20%222021-01-01T00%3A00%3A00%22%20%3A%3A%20floating\_timestamp%0A%20%20%20%20AND%20%222021-12-31T23%3A45%3A00%22%20%3A%3A%20floating\_timestamp%0AGROUP%20BY%20%60date\_occ%60/page/filter

[10] https://api.nasa.gov/DONKI

[11] https://kauai.ccmc.gsfc.nasa.gov/DONKI/search/