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Poster
It is well known that many local weather variables, such as temperature or precipitation, correlate with the 11-year solar cycle. Total Solar Irradiance (TSI) variations alone cannot explain this, and thus the physical forcing processes remain unknown. Here, we show that geomagnetic storms affect local weather on much shorter time scales much more profoundly than the solar cycle variations. We use the Disturbance Storm-Time (Dst) index to identify storm hours (SH) by requiring that Dst reaches a value below a given threshold (Dst storm values are negative.) We then use ERA5 reanalysis data on a grid across the North American continent for the period 1957-2023. For each Hour Of Year (HOY) we calculate the average (AV) and the standard deviation (STD) for a several weather variables over the this 67 year period. For each HOY we then calculate the anomaly as the difference between AV and the SH values, and average those over the 67 year interval. The anomaly values are normalized to the STD, sorted by season, and plotted as heat maps. We find significant anomalies for the variables temperature, pressure, precipitation, wind speed, and direct radiation, which are 2-3 orders of magnitude larger than the corresponding solar cycle variations. The anomalies also show significant regional and seasonal differences. Our results do not favor any particular physical process, but they provide critical constraints for models to explain the physical processes, for example cosmic ray effects on clouds or stratosphere - troposphere coupling.

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