Karin
Dissauer
NorthWest Research Associates, Boulder CO, USA
Graham Barnes, NorthWest Research Associates, Boulder CO, USA
KD Leka, NorthWest Research Associates, Boulder CO, USA, Nagoya University Japan
Eric L. Wagner, NorthWest Research Associates, Boulder CO, USA
Poster
The physical role played by small-scale activity, such as transient brightenings (TBs), that occur before the sudden onset of solar energetic events (SEEs, i.e., flares and CMEs) remains in question, especially regarding SEE initiation and early evolution.
We explore the origin of TBs and their potential connection to the main flare by examining their magnetic environment and the photospheric footprints of the coronal topological skeleton, including spines and separatrices of coronal null points, open field footpoints, and bald patches - all topological features that can be key to enable magnetic reconnection. We investigate whether specific topologies are more strongly linked to pre-flare TBs compared to similar activity during non-flaring times of the same active regions. Additionally, we analyze magnetic field characteristics, such as locations of strong-gradient polarity inversion lines (PILs) and areas of free magnetic energy, both crucial for flare processes.
For an initial set of pre-flare/quiet epoch pairs, we find that prior to flares, TBs 1) tend to occur in one large cluster close to the future flare ribbon location and below the separatrix surface of a null point, 2) are co-spatial with reconnection signatures, i.e., bald patches and null point fan traces and 3) cluster in the vicinity of strong-gradient PILs and regions of increased excess magnetic energy density. TBs are also observed during quiet epochs but appear in smaller clusters without a clear spatial pattern, predominantly away from strong-gradient PILs in areas with low excess energy density, although sometimes linked to spatially-intermittent bald patches and fan traces.

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