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Poster

EUV brightenings are small-scale magnetic reconnection events that consistently appear before and after solar flares. However, it is not well understood how EUV precursors might foreshadow flares and what the physical connection is between the EUV signatures and flares. We studied flare-active and inactive periods in three separate studies using the DEFT tool. In Study 1, EUV signatures were identified in 200 no-flare days, in Study 2 EUV signatures before 360 flares were analyzed, and in Study 3 close to 36,000 EUV signatures were detected, and their pre and post-flare distribution and trends were studied. Our key questions were: do EUV signatures occur consistently before flares, do EUV signatures occur without flares, are there flares without EUV precursors, and is it possible to forecast different magnitude flares based on preceding EUV signature trends? Study 1 showed that in no-flare periods EUV signatures were only detected 4% of the time. Study 2 showed that EUV precursors were present 92% of the time within 6 hours before $\leq C$ class flares. Study 3 showed that over 90% of the signatures were associated with flares ($\leq B$ class), and over 50% of all signatures were associated with $\leq M$ class flares. A superposed epoch analysis showed precursor frequency peaks at ~ 70 and 100 minutes before M and X class flares, respectively, while B and C class flares had no notable precursor frequency peaks. Using the DEFT tool on a combined flare/no-flare database produced the following skill scores: HSS (0.88), TSS(0.88), ACC (0.94), BACC (0.94), PRE (0.95), REC (0.93). These results demonstrate the significant potential EUV precursors have in improving space weather forecasting.

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