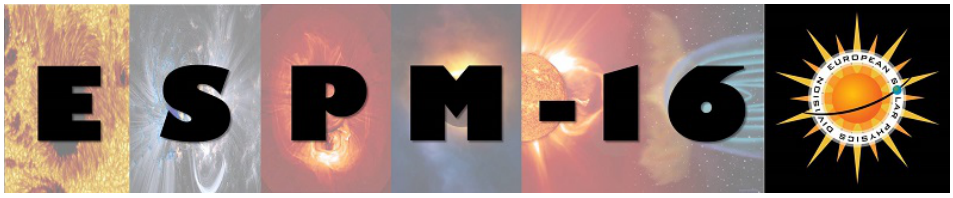

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Do conditions of the chromosphere and corona foretell active region flaring?

Tuesday 7 September 2021 12:05 (13 minutes)

Solar flares are powered by the evolution of the magnetic field, but it is still impossible to deterministically predict whether an active region will flare or not solely based on photospheric information. Observational case studies of the upper solar atmosphere reveal increased levels of magnetic reorganization, dynamics, and temperature variation prior to solar flares. Whether such signatures play a physical role in event initiation, and therefore could improve flare prediction, is still unclear. To this aim, we statistically analyze the coronal and chromospheric conditions prior to solar flares and during flare-quiet periods using data from the Atmospheric Imaging Assembly (AIA) onboard the Solar Dynamics Observatory. AIA Active Region Patches (AARPs), region-targeted extractions of AIA time-series data in (extreme-) ultraviolet are matched to the HMI Active Region Patches (HARPs) for 2010-2018. Pre-event dynamics and heating is parametrized with high-order moment summaries of brightness and running-difference images, plus emission measure, temperature, and density images; temporal behavior is captured by sampling each parameter over a 7hr time-series. NorthWest Research Associates'Classification Infrastructure (NCI), a well-established statistical classifier system based on Non-Parametric Discriminant Analysis is used to statistically evaluate whether parameters describing the upper atmosphere differ significantly between flaring-imminent vs. flare-quiet populations. Preliminary results and their physical implications will be presented. AARPs are constructed daily, from 15:48-21:48 UT (13 min intervals each hour, time cadence 72s) and will be freely available with this study's publication at www.nwra.com/AARP. This work is supported by NASA Grant HGI/80NSSC19K0285.

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