Plasma Diagnostics of Microflares observed by STIX and AIA

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Solar flares are generally thought to be the impulsive release of magnetic energy giving rise to a wide range of solar phenomena that influence the heliosphere and in some cases even conditions of earth. Part of this liberated energy is used for particle acceleration and to heat up the solar plasma. The Spectrometer/Telescope for Imaging X-rays (STIX) instrument onboard the Solar Orbiter mission launched on February 10th 2020 promises advances in the study of solar flares of various sizes. It is capable of measuring X-ray spectra from 4 to 150 keV with 1 keV resolution binned into 32 energy bins before downlinking. With this energy range and sensitivity, STIX is capable of sampling thermal plasma with temperatures of ≳10 MK, and to diagnose the nonthermal bremsstrahlung emission of flare-accelerated electrons. During the spacecraft commissioning phase in the first half of the year 2020, STIX observed 68 microflares. Of this set, 26 events could clearly be identified in at least two energy channels, all of which originated in an active region that was also visible from earth. These events provided a great opportunity to combine the STIX observations with the multi-band EUV imagery from the Atmospheric Imaging Assembly (AIA) instrument on board the earth orbiting Solar Dynamics Observatory (SDO). For the microflares that could be identified in two STIX science energy bands, it was possible to derive the temperature and emission measure (EM) of the flaring plasma assuming an isothermal source. For larger events where more detailed spectra could be derived, a more accurate analysis was performed by fitting the spectra assuming various thermal and nonthermal sources. These results are compared to the diagnostics derived from AIA images. To this aim, the Differential Emission Measure (DEM) was reconstructed from AIA observations to infer plasma temperatures and EM in the flaring regions. Combined with the the relative timing between the emission seen by STIX and AIA, this allows us to get deeper insight into the flare energy release and transport processes.