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X-ray observations of small-scale flaring energy releases

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X-ray observations provide insight into the energy release in solar flares - the heated material and accelerated particles detectable via thermal and non-thermal bremsstrahlung emission respectively. We present observations of small active regions flares and even smaller quiet Sun “flares” observed with the Nuclear Spectroscopic Telescope Array (NuSTAR), a highly sensitive telescope providing imaging spectroscopy > 2 keV. With active region microflares we show that heating to ~ 10 MK and acceleration of electrons is still present, much like larger flares. We present some microflares that were jointly observed with NuSTAR and the Spectrometer Telescope for Imaging X-rays (STIX) on Solar Orbiter, providing different viewing angles of the energy release. We also present some quiet Sun (non-active region) impulsive energy releases observed with NuSTAR during the recent solar minimum, investigating whether “flare-like” energy release continues outwith active regions. All these observations are also considered in the context of EUV emission seen by the SDO/AIA and softer X-ray with Hinode/XRT.

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