ONSITE

Author: S. Krucker
title: Limb-Occulted Flare Observations with HXI, GBM, and STIX
abstract: I will make remarks on occulted flare observations with STIX and HXI.

Author: Allan Sacha Brun
title: Analysis of intense flares occurring on a long lasting active nest in the Sun as seen by SolarOrbiter/STIX. (A.S. Brun, A. Finley, A. Strugarek et al..., CEA Paris-Saclay).
abstract: We have identified the existence of active nests in 2022 that extents to 2023 and 2024 thanks to the 360° monitoring of the solar activity when Solar Orbiter is on the far side with respect to the Earth. In this presentation we will discuss the first analysis of some of the intense events identified to occur within the active nest. In particular we will discuss our attempt to assess the impact of the attenuator on the reconstruction of the flares energetics.

Author: Natalia Bajnokova
title: Observations of a faint non-thermal emission during a GOES C-class flare
abstract: We present an analysis of the X-ray emission observed during a C-class flare on September 6, 2022, using the Nuclear Spectroscopic Telescope Array (NuSTAR) and the Spectrometer/Telescope for Imaging X-rays (STIX) on Solar Orbiter. The flare was occulted for NuSTAR but on-disk for STIX, allowing us to probe a possible non-thermal coronal source with NuSTAR and bright lower-atmosphere emission with STIX. NuSTAR observed faint ~10 MK thermal and non-thermal coronal sources starting 7 minutes prior to the flare. The spectral parameters of the non-thermal coronal sources remained consistent throughout the entire 7-minute interval; however, they varied spatially. The spectral indices from the thin-target NuSTAR pre-flare fits agree with the value obtained from non-thermal footpoint emission observed by STIX during the impulsive phase of the flare. This might suggest a possible link between the electron populations observed by the two instruments.

Author: Limousin Olivier
title: Detector Update
abstract: I will present detector performance update and report on noise assessment as well as energy calibration.

Author: Muriel Zoë Stiefel
title: Imaging the superhot thermal component with STIX
abstract: Discussion on joint fitting using imaging and BKG detector of STIX followed by a discussion on a new approach how we can image the two thermal and the nonthermal component individually with STIX data.

Author: Gelu M. Nita
title: Disentangling EUV Emission from the Solar Transition Region and Corona Using Solar Orbiter and SDO Observations and 3D Data-Constrained Modeling with GX Simulator
abstract: Understanding the physical processes occurring in distinct layers of the solar atmosphere is a fundamental challenge in solar physics. This study introduces a stereoscopic framework to disentangle the contributions of the transition region (TR) and corona to extreme ultraviolet (EUV) emission. By leveraging an optimal quadrature configuration of Solar Orbiter and SDO, combined with advanced 3D modeling using GX Simulator, we achieve a geometrical and spatial separation of TR and coronal emissions—an objective difficult to attain with single-perspective observations. Solar Orbiter's limb-side view of an active region (AR) enables a unique geometrical separation of coronal and TR emissions, minimizing overlap except near the limb. Meanwhile, SDO's near-disk-center view of the same AR provides an integrated perspective, capturing the combined TR+corona emissions along the line of sight. By combining these complementary observations with data-constrained modeling techniques, we reconstruct the spatial distribution of TR emission with improved accuracy.
Central to this effort is GX Simulator, a data-constrained modeling framework within the SolarSoftWare (SSW) repository. Using SDO/HMI vector magnetic field data, we generate a 3D nonlinear force-free field (NLFFF) model of the AR and populate it with differential emission measure (DEM) distributions inferred from a tunable parametric model based on the Enthalpy-Based Thermal Evolution of Loops (EBTEL)

framework. The synthetic EUV emission maps created for both perspectives enable direct comparison with observations, ensuring high fidelity and consistency. This approach significantly enhances spatial disentanglement techniques. By tuning the model to Solar Orbiter's limb observations and rotating it to Earth's perspective, we reconstruct the TR contribution without requiring additional empirical assumptions. This methodology may advance our understanding of the magneto-thermal structure of ARs, improving our insight into energy transport and dynamics in the upper solar atmosphere.

Author: Adam Finley
title: Prolific Solar Flare Factories: Monitoring Active Region Nests with Solar Orbiter
abstract: Magnetic activity varies over the solar cycle and is not uniformly distributed across the Sun's surface. Areas on the Sun with recurring flux emergence are called active region nests and show structure in longitude. These nests are thought to form due to non-axisymmetries in the generation and storage of the Sun's dynamo magnetic field. The nesting of magnetic activity is also observed on other Sun-like stars, suggesting that it is a fundamental process related to dynamo magnetic fields. However, our ability to study the long-term evolution and activity of solar active region nests is limited by their visibility from Earth. With ESA's Solar Orbiter periodically observing the Sun's far-side (akin to the STEREO-AB era), active region nests can now be studied in greater detail and over timescales of several solar rotations. Joint-observations of active region nests from the current solar cycle have shown that they produce more complex active regions (Hale classifications) with a higher occurrence rate of solar flares. Nested flux emergence also reinforces self-similar magnetic field topologies in the solar corona that can be leveraged when predicting the magnetic connectivity of spacecraft. In future, short to medium-term space weather forecasting will benefit from the improved identification and monitoring of active region nests.

Author: Antoine Strugarek
title: Sympathetic flares and magnetohydrodynamical avalanches
abstract: Solar eruptions stem from a variety of phenomena involving the release of magnetic energy. The phenomenology of solar flares can be mimicked with so-called cellular automata, or avalanche models. These toy models have the advantage of reproducing many statistical features of solar flares, and can even be used to reproduce the features of sympathetic flare. Though, they generally lack a sound physical justification. In this presentation we will cover recent endeavours that aimed to (i) uncover the statistics of sympathetic flares — including the STIX flare list (Guité et al. 2025, doi 10.1051/0004-6361/202452381) ; (ii) model this sympathy with coupled avalanche models reproducing their statistics (Guité et al. 2025, submitted to Solar Physics); and (iii) unveil the avalanche nature of dissipative regions within MHD simulations, bridging the gap between MHD and avalanche models (Lamarre et al. 2025, submitted to PRL). We will report on a recent statistical analysis of sympathetic flares, utilizing data from multiple instruments (SDO/AIA, RHESSI, and Solar Orbiter/STIX) that collectively span from the peak of solar cycle 23 to the present. Our analysis reveals a significant overabundance of hemispheric pairs of flares with short waiting times ($w \leq 1.5$ hours) that are separated by approximately 30 degrees in longitude. The occurrence rate of sympathetic flares is estimated to be around 5% across the three instruments. Following this study, we will show how simple, coupled avalanche models can be built to reproduce some features of sympathetic flares. In particular, our study suggests that sympathetic solar flares are adequately simulated by weakly coupled avalanche models, showing an excess of pairs of events at short waiting times but with no correlation in the energy of the sympathetic flare pairs. It also suggests a pathway to identify sympathetic flares on other stars, if they happen to have stronger couplings. Those sandpile models, though, generally lack a sound physical justification. We will end our presentation by reporting on the identification of avalanching behavior in magnetohydrodynamical (MHD) numerical simulations of chromospheric dynamics driven by photospheric motions (with the BIFROST and PLUTO codes). We will briefly discuss the potential of such MHD simulations in providing guidance towards designing better physically motivated evolutionary rules for existing avalanche models used for e.g. flare prediction.

Author: Karol Kułaga
title: An in-depth analysis of background level registered by STIX in every pixel.
abstract: Analysis of background files from January 2022 to July 2023 confirms that the background recorded by the STIX instrument is predominantly influenced by 133Ba. This prevalence leads to overestimated values in individual pixels or detectors, particularly in energy ranges close to the strong spectral lines of 133Ba. The

process of background interpolation enables the determination of background values during periods of high solar activity and at small distances from the Solar Orbiter to the Sun. Furthermore, utilizing the interpolated background for reconstructing X-ray images has improved the count-based algorithms' (EM, MARLIN) performance and allowed for reconstructing phenomena with a smaller number of recorded counts. The other finding is that the visibility-based algorithms react to background subtraction, which is rather unexpected. While for the FF_PSO the problem seems to be small, the MEM_GE shows large variability of derived sources' parameters.

Author: Paolo Massa
title: Latest results on the STIX data calibration process
abstract: In this talk I will present the latest results on the ongoing STIX data calibration effort. Specifically, I will describe how the science data are corrected within the imaging and spectroscopy software by means of a daily Energy LookUp Table (ELUT). Further, I will provide details about the state-of-the-art of the instrument grid calibration.

Author: Arun Kumar Awasthi
title: Probing seed electron characteristics through nonthermal emission and solar energetic electrons (SEEs): STIX and EPD observations
abstract: Solar flares are energetic and dynamic phenomena in the solar system emitting radiation impulsively, and solar energetic electrons (SEEs). To examine the characteristics and energetics of seed electron population that is responsible for hard X-ray (HXR) emission and SEEs, we investigate 4 flares (3 B and 1 C1.6 intensity class; SOL2021-09-26T11:41, SOL2021-09-27T11:40, SOL2021-09-28T01:42, SOL2021-09-28T06:26) during 26-28 September 2021, originated from AR12871, and associated (in time) with SEE enhancements recorded using EPD suite onboard Solar Orbiter mission. We conducted spectral analysis of hard X-ray emission observed by STIX and in-situ electrons. Our analyzed events exhibited a breadth of diversity in terms of - dynamic nature at the source, disparate thermal-nonthermal emission partition, and different spectral types of in-situ electrons. For example, clear SEE association with the weak B3-class enhancement (SOL2021-09-26T11:41) with remarkably hard HXR emission (nonthermal electron (NTEs) spectral index (δ) ~ 6) despite a SEE-less C3 flare (SOL2021-09-26T11:24) occurring the same active region with a maximum just 17 minutes ago. On the other hand, despite exhibiting very weak HXR emission, the investigated C1.6 flare (SOL2021-09-28T06:26) is found to be associated with SEEs with a hard spectra and exhibiting an associated DH type-II burst. Therefore, the invesitgation of such a diverse group of flares with associated electron events aims to enrich our knowledge of the energetics of seed electron population and the effect of further acceleration of SEEs.

Author: Laura Hayes
title: What Do STIX Flares Look Like? A Statistical Exploration of Flare Time Profiles
abstract: Now with over 4 years of observations, STIX has recorded a rich and growing sample of solar flares across a wide range of magnitudes and morphologies. In this talk, I'll present a statistical look at STIX flare time profiles - how they rise, peak, and decay - and what this tells us about flare variability and energetics. I'll discuss trends across different flare classes, durations, and source locations, and highlight common and uncommon features in the temporal evolution of the X-ray emission. As part of this, I'll touch on quasi-periodic pulsations (QPPs) as a particularly interesting subset of time variations, and discuss how frequently they appear in the dataset. The goal is to build a clearer picture of the typical (and atypical) time structures in STIX flares, and lay the groundwork for more detailed studies going forward.

Author: Samuel Carter
title: A new methodology for inferring the plasma conditions in solar flare energetic electron source regions from in-situ electron energy spectra
abstract: The conditions within the regions of solar flares which accelerate electrons, and the parameters that lead to those acceleration mechanisms, are not well constrained. It is not clear whether the populations accelerated out into the heliosphere and inward into the chromosphere originate in the same regions via the same mechanisms. By analysing the energy distributions of these populations, it should be theoretically possible to see evidence of their original regions. By creating and utilising a novel in-situ spectral analysis package called INSPEX we have performed this analysis for in-situ observations of a solar flare on 9th of

October 2021, deriving both fluence and peak flux spectra from SolO EPD and SWA data. Generating these spectra has proven challenging, and we discuss the processing required to get from raw data to final spectrum. We find that the temperature values discovered with this technique are within the range of $15 - 20$ MK, as may be expected for solar flares. Our future work will include a comparison of STIX spectral parameters with those found through this methodology.

Author: Dominik Gronkiewicz
title: In search for strongly non-thermal flares using CNN-based machine learning algorithm
abstract: The spectro-temporal characteristics of solar flares observed in X-ray may have varying contributions of thermal and non-thermal components. Studying the non-thermal impulsive phase is important for our understanding of electron acceleration during the energy release in solar flares. There are many approaches to quantify the relation between thermal and non-thermal emission in the flares. The empirical Neupert effect is a simple yet powerful and physics-motivated relation which may be used as a reference to compare the two components. Hard X-ray band, which will typically contain the non-thermal component, will deviate from what is predicted by the equation, and this deviation may be used to quantify the strength of non-thermal response. Recent development of data science has brought novel approaches to time series processing. In our work, we study the feasibility of utilizing neural networks to identify strongly nonthermal flares among ca. 70000 entries in STIX Flare Catalog. We use the quicklook lightcurve profiles for classification, since this data product is available for the entire span of STIX operation, as well as spectrograms which are available for the more recent observations. We test whether a simple 1D convolutional autoencoder is able to capture the “average flare profile” and surpass the classical approach based on the Neupert effect to identify the events which are interesting due to their strongly thermal or strongly non-thermal nature.

Author: Andrea Francesco Battaglia
title: New insights into hard microflares
abstract: This is a follow up presentation from the last STIX meeting. I will present recent findings concerning hard microflares.

Author: Alexander Warmuth
title: CoSEE-Cat: a Comprehensive Solar Energetic Electron event Catalogue
abstract: I will present new results and developments regarding our work on solar energetic electron events. This is a joint effort of eight of Solar Orbiter's instruments (STIX, EPD, EUI, RPW, Metis, SoloHI, SWA, and MAG). Besides statistical results, I will present the online version of our catalogue.

Author: Jake Mitchell
title: Using the python based Sunkit-Spex to fit STIX spectra
abstract: I will present initial results, using the new version of Sunkit-Spex to fit STIX spectra, primarily focussing on a sample of large flares of M5 class and above.

Author: Melissa Pesce-Rollins
title: Probing ion acceleration through multiwavelength observations of Solar flares
abstract: Greater than 100 MeV gamma-ray emission require ions to be accelerated to energies higher than 300 MeV where the pion production process dominates. Solar flares have been known to emit at these energies for decades now and several different classes of gamma-ray solar flares have been identified, namely behind-the-limb, impulsive and long duration. The current high-energy gamma-ray detectors have limited imaging capabilities compared to the requirements for solar science and as such they can essentially only provide spectral and timing information. Consequently, very little is known about the temporal and spatial connections between accelerated electrons and ions. In this presentation, we will discuss the latest results on the joint observations in gamma-rays, X-rays, radio and EUV of behind-the-limb and impulsive flares observed by Fermi-LAT. These results show how important multiwavelength detections are to probe ion acceleration during solar flares.

Author: Song Tan
title: Transient and diverse coronal jets around an erupting filament captured by Solar Orbiter

abstract: Solar jets represent collimated, beam-like plasma ejections that manifest magnetic reconnection processes in the solar atmosphere. Using Solar Orbiter's Extreme Ultraviolet Imager (105 km/pixel, 2s cadence), we identified nine distinct transient jets during a limb filament eruption on September 30, 2024, with a median lifetime of only 22 seconds—substantially shorter than traditional coronal jets. These jets exhibit diverse morphologies and properties that correspond to different phases of the filament eruption: standard jets appear during initiation, short-lived jets during the raising, and blowout-like jets during peak eruption. Their spatial distribution and temporal evolution suggest they form through magnetic reconnection between the erupting filament and overlying magnetic fields. This discovery of extremely transient jets, previously undetectable with conventional instruments, reveals more complex reconnection-driven processes during filament eruptions and demonstrates how high-resolution observations can unveil fundamental plasma ejections that contribute to our understanding of energy release in the solar corona.

Author: Hannah Collier
title: An overview of Solar Orbiter's major flare campaigns of Spring 2025
abstract:-

Author: Lindsay Glesener
title: Updates on the FOXSI experiment
abstract: I will give an overview of the FOXSI sounding rocket experiment, including details of recent and upcoming flights. FOXSI stands for the Focusing Optics X-ray Solar Imager, and it is an experiment utilizing direct focusing telescopes to study the Sun in soft and hard X-rays. The FOXSI-4 sounding rocket flew last April for the first NASA sounding rocket observation of a large M1 solar flare, and the fifth iteration of the payload will fly in the next year. In this talk, I will give an overview of the status of the project and a look at preliminary results.

Author: Jana Kašparová
Title: Flares in X-ray and optical emission observed at Ondřejov observatory
Abstarct: I will present analysis of several flares detected in X-rays and by optical instruments at Ondřejov observatory.

Author: Alessia Guidetti
Title: Emission Measure Imaging from STIX Data
Abstarct: In particularly intense flares, the standard assumption of a single-temperature plasma is often no longer valid, requiring more advanced diagnostic techniques. In this talk, I will present a novel method for analyzing the thermal structure of solar flares, with a focus on disentangling multiple sources of thermal emission. Specifically, I will introduce an approach to reconstruct spatially resolved emission measure (EM) maps for distinct thermal components at different temperatures. In addition, I will show how this method can be extended to image the spatial distribution of non-thermal emission, offering a more complete view of the flare structure. The technique is based on directly imaging the emission measure using STIX data, enabling us to isolate and visualize the contributions from both thermal plasmas and non-thermal sources.

Author: Barbara Palumbo
Title: 3D Reconstructions of Solar Flares from Real STIX and HXI Data
Abstarct: In this presentation, we showcase three-dimensional reconstructions of solar flares using real observational data from the Spectrometer/Telescope for Imaging X-rays (STIX) and the Hard X-ray Imager (HXI). By combining these datasets, we evaluate the method’s effectiveness in analyzing flare structure and determining its position. We also discuss its limitations, including instrumental constraints and reconstruction uncertainties, while highlighting potential improvements for future studies.

Author: Anna Volpara
Title: Greedy approaces for astronomical imaging
Abstarct: Reconstructing an image from a highly sparse set of Fourier domain samples presents a significant numerical challenge, as the quality of the inversion process is strongly influenced by both the number and distribution of available data points. In practical scenarios, these sampling constraints are often dictated by

instrumental hardware limitations. We explore numerical strategies based on greedy algorithms to optimize the selection of Fourier samples, aiming to improve the reconstruction process. This study has broad applicability, particularly in astronomical imaging, where efficient data acquisition is crucial for high-fidelity image recovery.

Author: Meriem Alaoui
Title: Reduction of the Downward Energy Flux of Nonthermal Electrons in the Solar Flare Corona due to Cospatial Return-current Losses
Abstarct: High-energy electrons carry much of a solar flare's energy, making changes in their beam distributions during propagation critical to understand. We focus on how cospatial return currents reduce the energy flux of these accelerated electrons, systematically quantifying this reduction across relevant beam and plasma parameters. Using a 1D model, we incorporate collisions, return-current electric field deceleration, warm-target thermalization, and runaway electron contributions. In the classical (Spitzer) regime, return-current losses are negligible only for the lowest nonthermal fluxes. We determine when these losses become significant and how they modify the beam's energy flux density. At higher fluxes, we also identify conditions where (1) runaway electrons become important and (2) current-driven instabilities may arise, necessitating more complete models. Runaway electrons reduce return-current losses and relax instability thresholds. All results depend on beam and plasma conditions. We also assess electron reflection by the return-current field and argue that several flare interpretations should be revised to include these effects.

Author: Abdallah Hamini
Title: Radio-monitoring Solar Radio Orbiter Instruments : tools for fast access to space and ground-based radio observations
Abstarct: Solar Radio Monitoring (secchirh.obspm.fr) is a website for the combined visualization of solar radio data. The main objective of this website is to support multi-wavelength data analysis from ground-based and space missions dedicated to research on solar activity and on solar terrestrial relationships. It produces and provides synthetic data integrating the mapping of sources observed by Nançay Radio Heliograph (NRH) and composite dynamic spectra. The combined survey provided allows to quickly identify and select solar events, to identify the complementary data from the space missions and give an overview of the coronal and interplanetary situation. The energetic electrons that are injected from the low corona to the interplanetary medium are detected via the radio emissions they produce in the high corona and the interplanetary medium. On the other hand, the analysis of the spectra observed by X-ray instruments allows to obtain quantitative information on the characteristics of accelerated electrons in the active region and on the thermal energy contained in the plasma. Furthermore, EPD (The Energetic Particle Detector) measures electrons, protons and heavy ions with high temporal resolution over a wide energy range, from suprathermal energies up to several hundreds of MeV/nucleons allowing full particle identification. The combination of STIX (The Spectrometer Telescope for Imaging X-rays), EPD and RPW (Radio & Plasma Waves) data with radio-monitoring surveys is a major asset for scientific research and space weather activities. This combination provides a fast visualization of data which in particular contribute to the fundamental questions on the nature of the sources, the mechanisms of acceleration and energy particle transport
processes. Data from Solar Orbiter instruments are integrated in the radio-monitoring website in combination with other space and ground-based instruments in order to facilitate the access to Solar Orbiter data for non-expert and to provide to radio- astronomers complementary diagnostics for solar activity. In addition, we present the new developement for STIX graphical user interface to visualize and analyze the STIX data. This application allows to perform easily spectral analysis of STIX data.

Author: Lucia Abbo
Title: Metis observations and data archive
Abstarct: In this presentation, observations at high cadence acquired by the Metis coronagraph will be shown with some recent results. Moreover, an overview on the Metis data archive will be given for future collaboration with STIX team.

Author: Nils Janitzek

Title: Updates from the Solar Orbiter Archive: Field-of-View Tool and Flare-SEP Linkage Tool

Author: Janusz Sylwester
Title: TEMIRA performance for synthetic Palermo-Harvard flare models
Abstarct: TEMIRA (Temperature, Emission Measure, and Iron Abundance) is a flaring plasma analysis package currently under development at Wroclaw.
Early applications of TEMIRA to STIX pixel spectra observations indicate substantial variations in iron elemental abundance in every event analyzed.
To avoid misinterpretation, we conducted dedicated tests of TEMIRA to reconfirm its ability to detect even the smallest changes in iron plasma content, as derived from STIX spectral measurements in the standard 4-5-6-7-8-9 keV thermal range.
In these tests, we used results from Palermo-Harvard flare modeling to predict STIX spectral shape variations, as well as synthetic profiles of iron abundance time variations.
The methodology and results obtained will be presented and discussed

ONLINE
Author: Yuankun Kou
Title: Observations and modeling of solar flare energetic electrons in hard X-ray, radio and in-situ near 1 AU
Abstarct: Magnetic turbulence effectively influences the transport of energetic electrons through the interplanetary space. In this work, we analyze 13 energetic electron events detected in situ by the Wind 3D Plasma and Energetic Particle (3DP) instrument, within the time period from 2002 to 2024, to investigate the energy dependence of turbulence on the propagating electrons. All events we select are accompanied by interplanetary type III radio bursts and hard X-ray emissions to trace them back to a solar flare origin. The HXR observations by RHESSI, Fermi, and STIX are utilized to constrain the injection time. We find that the rise and delay time of in-situ electron flux profiles show a clear power-law decreasing trend with respect to the electron energy statistically, while the decay time shows either increasing or decreasing trends for different events. Further, we model the turbulent scattering and numerically simulate the propagation of electrons. We find that the dependence of turbulent scattering on the electron energy and on the distance from the Sun, as well as a parameter relating to the resonance broadening (or nonlinear effects) are all important factors to successfully reproduce the observational results.

Author: Daniel Clarkson
Title: Solar Flare Accelerated Electrons and their Radio Emission Along the Parker Spiral: Simulations and Simultaneous Observations from SolO, PSP, STEREO & WIND
Abstarct: Solar flares routinely accelerate electrons that travel along magnetic field lines from the Sun through the heliosphere, producing solar radio bursts. At the same time, electrons propagating downward along the field lines produce X-ray counterparts, revealing the flaring location in the lower corona. Using multi-vantage-point interplanetary type III solar radio burst observations and radio-wave propagation simulations, we show that the magnetic field not only guides the emitting electrons, but also directs radio-waves along the large-scale structure of the Parker spiral through scattering from anisotropic density irregularities in the magnetised plasma. As a result, the peak radio intensity at 200 kHz is displaced by ~30 degrees in longitude in the direction of the Parker spiral curvature, away from the corresponding X-ray signatures and flare location. By tracing the radio emission across multiple frequencies, we disentangle the effects of anisotropic scattering from electron motion along the interplanetary magnetic field, unveiling the emission source locations and improving their association with the flaring region.

Author: Yingjie Luo
Title: Characterizing Flare-Associated Electrons with HXR Warm-Target and DEM Diagnostics
Abstarct: Understanding the properties and dynamics of energetic electrons in solar flares is critical for advancing our knowledge of flare energy release and particle acceleration. A key challenge lies in the fact that electrons of different energies are best probed by observations at different wavelengths. Hard X-ray (HXR) observations serve as powerful diagnostics for high-energy accelerated electrons, while EUV observations

from AIA are sensitive to plasma below approximately 20 MK. Recent studies employing the warm-target HXR emission model in a kappa-form electron distribution, have shown that the accelerated electrons across the full energy range can be effectively constrained. In this study, we analyze two GOES M-class limb flares using both warm-target HXR model and differential emission measure (DEM) diagnostics to characterize flare-associated electrons. Our results confirm that the warm-target model can well constrain the flare-associated electrons when accounting for differences in thermal parameters derived from X-ray spectra compared to those from DEM analysis. Furthermore, DEM diagnostics offer valuable insights into the thermal environment of potential acceleration or injection sites. By comparing the DEM distributions with the mean electron flux spectra, we demonstrate that accelerated electrons represent only a small fraction of the total electron population within the flaring region. This study highlights the effectiveness of the warm-target model, when combined with DEM diagnostics, in capturing the key characteristics of flare-associated electron populations.

Author: Debesh Bhattacharjee
Title: Total Power and Low-energy Cut-off Time Evolution of Solar Flare Accelerated Electrons Using X-Ray Observations and Warm-Target Model
Abstarct: A primary characteristic of solar flares is the efficient acceleration of electrons to nonthermal deka-keV energies. While hard X-Ray (HXR) observation of bremsstrahlung emission serves as the key diagnostic of these electrons. In this study, we investigate the time evolution of flare-accelerated electrons using the warm-target model. This model, unlike the commonly used cold-target model, robustly determines the low-energy cut-off in the nonthermal electron distribution, so that the energetics of nonthermal electrons can be deduced accurately. Here, we examine the time-evolution of nonthermal electrons in flares well-observed by the RHESSI and the Solar Orbiter (SolO, using the STIX instrument) spacecrafts. Using spectroscopic and imaging HXR observations, the time evolution of the low-energy cut-off of the accelerated electron distribution, the total power of nonthermal electrons, total rate of nonthermal electrons, and excess thermal emission measure from the nonthermal electrons, are investigated. We find that the time profile of the low-energy cut-off of the accelerated electron distribution shows a high-low-high trend around the HXR bursts of flares, while the time evolution of the total rate of injected electrons shows a low-high-low behavior. Although the total power of nonthermal electrons is sensitive to the cut-off energy, the temporal variation of the flare power follows the temporal variation of the acceleration rate. We further find that the highest contribution of the excess thermal emission measure coming from thermalization of injected electrons takes place around the hard X-ray peak.

Author: Gordon Hurford
Title: STIX - A Retrospective
Abstarct: A review of the history of STIX, including lessons learned from its design,. calibration and operation.