

## **The Flaring Sun: X-ray Diagnostics of Solar Flares with Solar Orbiter**

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Solar flares are among the most powerful physical phenomena in the solar system, releasing vast amounts of energy in the form of radiation, energetic particles, and coronal mass ejections. Understanding the underlying plasma processes that drive flare energy release and particle acceleration remains a key challenge in astrophysical plasma physics.

The ESA/NASA Solar Orbiter mission, launched in 2020, offers a unique vantage point to study solar flares, combining remote-sensing and in-situ instruments to provide multi-wavelength diagnostics of flare-related processes. The Spectrometer/Telescope for Imaging X-rays (STIX) delivers high-resolution imaging and spectroscopy in the hard X-ray domain, probing flare-accelerated electrons and the thermal response of the solar atmosphere. Complementary observations from the Extreme Ultraviolet Imager (EUI) provide detailed views of the flare evolution in the extreme ultraviolet (EUV), capturing the dynamic response of coronal plasma. Together, these instruments offer unprecedented insights into the interplay between accelerated particles and the ambient plasma during flares.

In this talk, I will highlight the recent four years of flare observations from Solar Orbiter. I will discuss how the combination of X-ray and EUV diagnostics is advancing our understanding of energy release and transport in solar flares. Emphasis will be placed on the diagnostic techniques used to interpret multi-wavelength observations and their broader relevance for plasma physics.