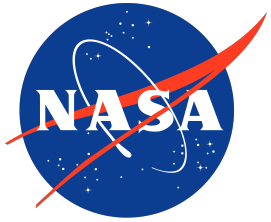


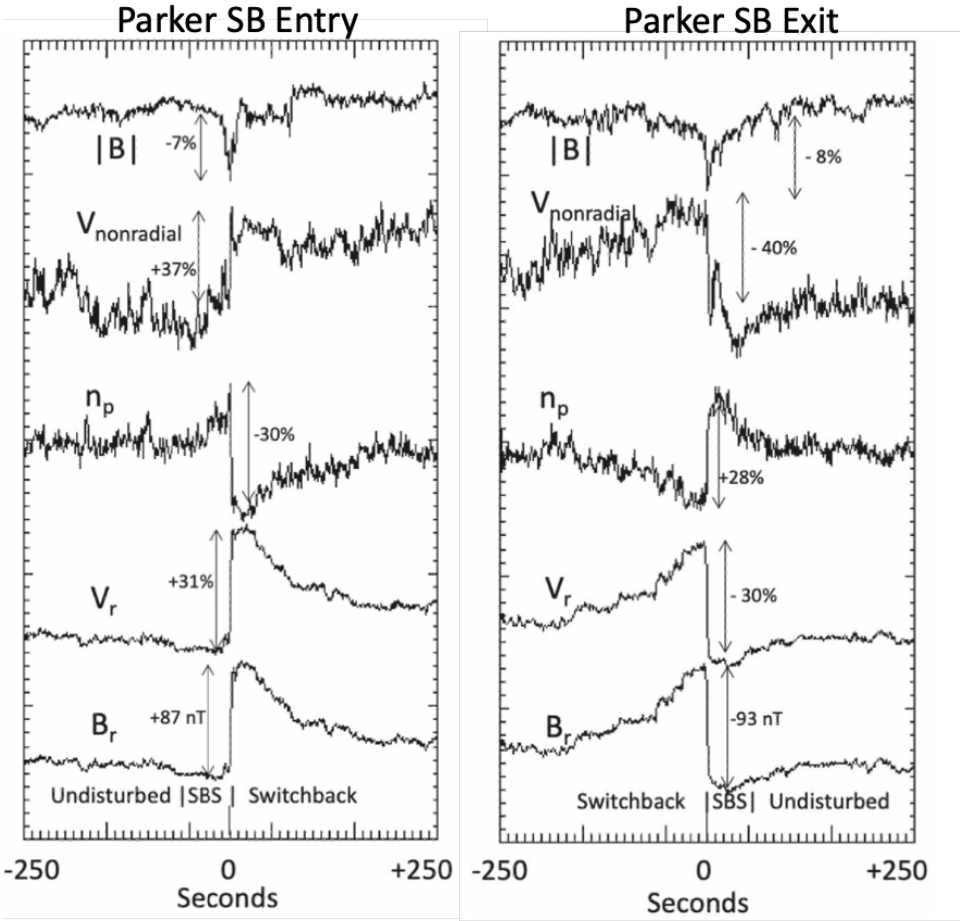
Correlated Magnetic Field Dropouts and Plasma Wave Activity at Switchback Boundaries as Observed by Parker Solar Probe

A. P. Rasca, W. M. Farrell, P. L. Whittlesey, R. J. MacDowall, S. D. Bale, J. C. Kasper

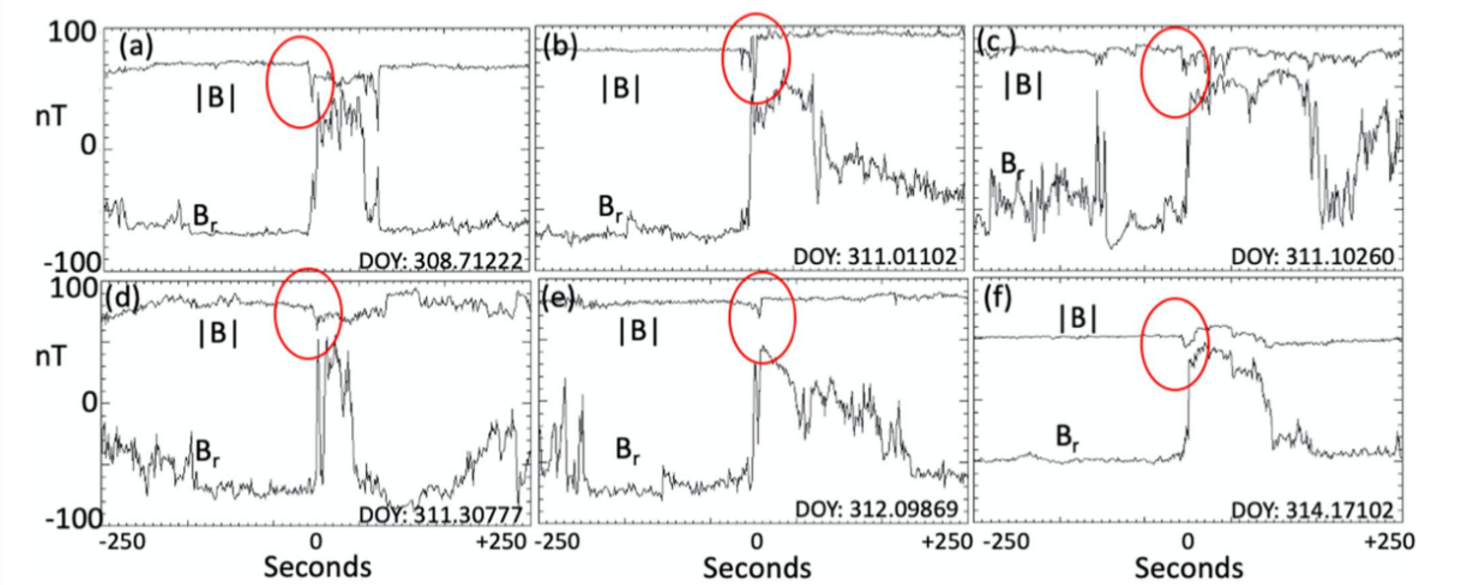
Early Switchback Boundary Analysis

Superposed Epoch Analysis: IBI Dropout

- Co-added ~25 of the most intense SB boundary entries and exits defined by the Switchback Index (SBI) during E1 (Farrell et al., 2020)
- Dropouts in IBI at the boundaries appeared consistent enough to show up in the epoch analysis
- IBI dropouts at SB boundaries have been associated with current layers possibly connected back to reconnection regions (Froment et al., 2021)



B-Field Dropouts at SB Boundaries



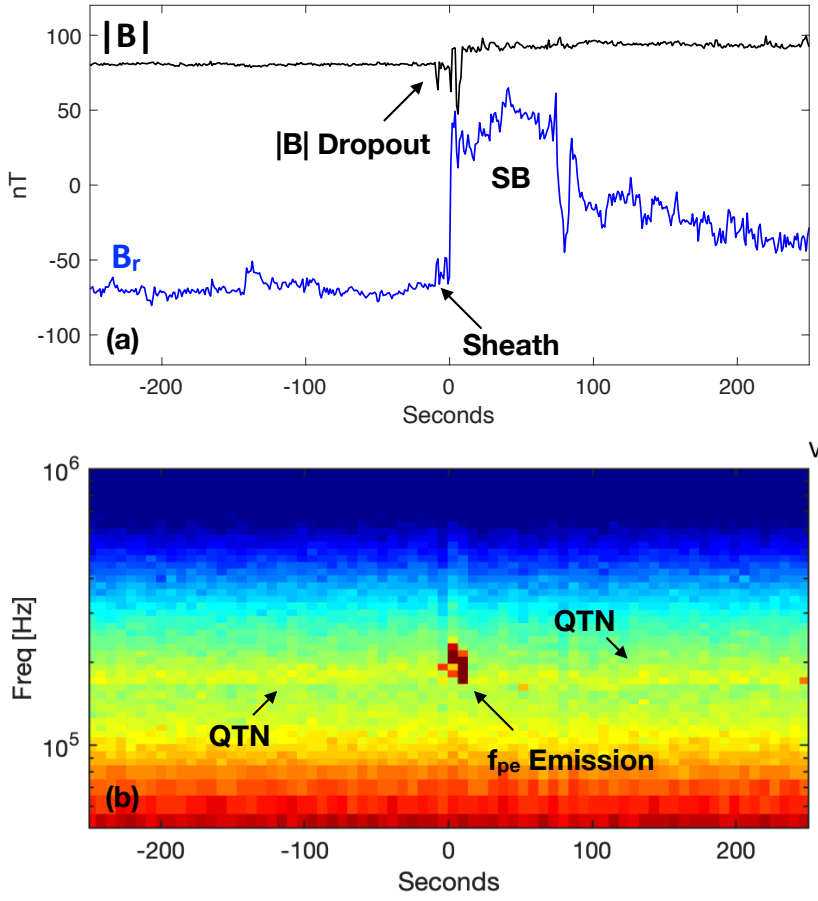
Farrell et al., 2020

- f_{pe} emissions and electron beams have been detected in association with reconnection events, with such currents possibly being short-lived due to kinetic instabilities that stimulate plasma waves (Farrell et al., 2002, 2003)

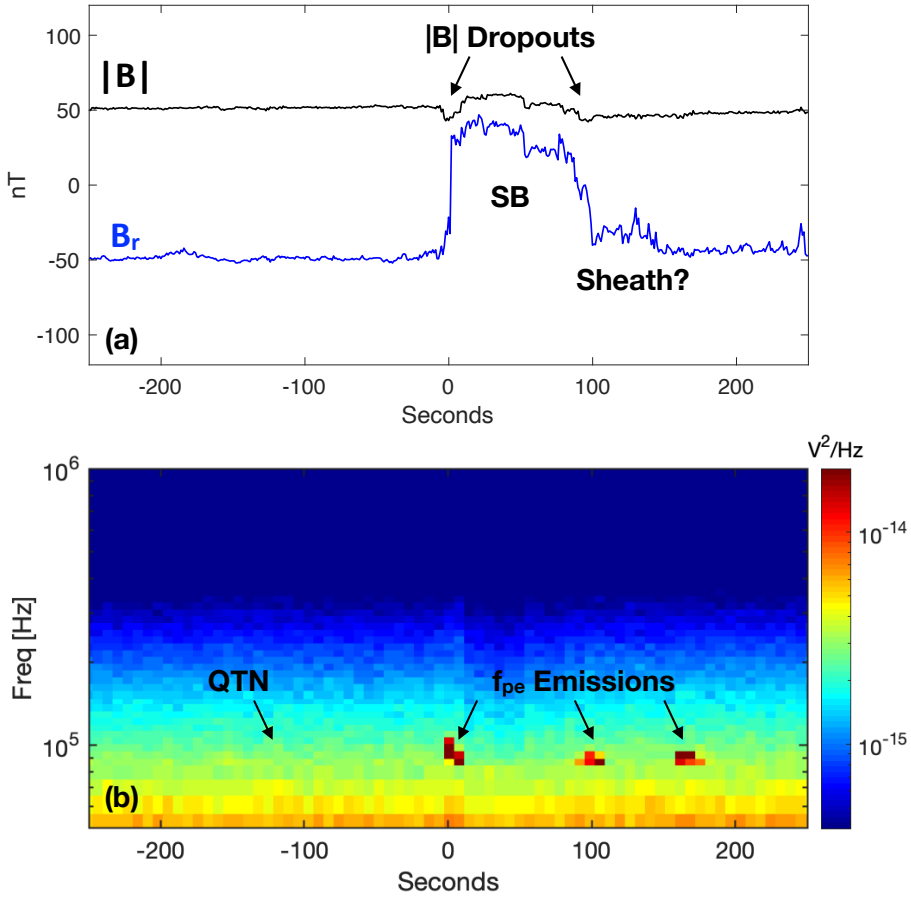
- We expect f_{pe} emissions associated with B-drops and current systems to form along SB boundaries

Associated B-Field Dropouts and f_{pe} Emissions

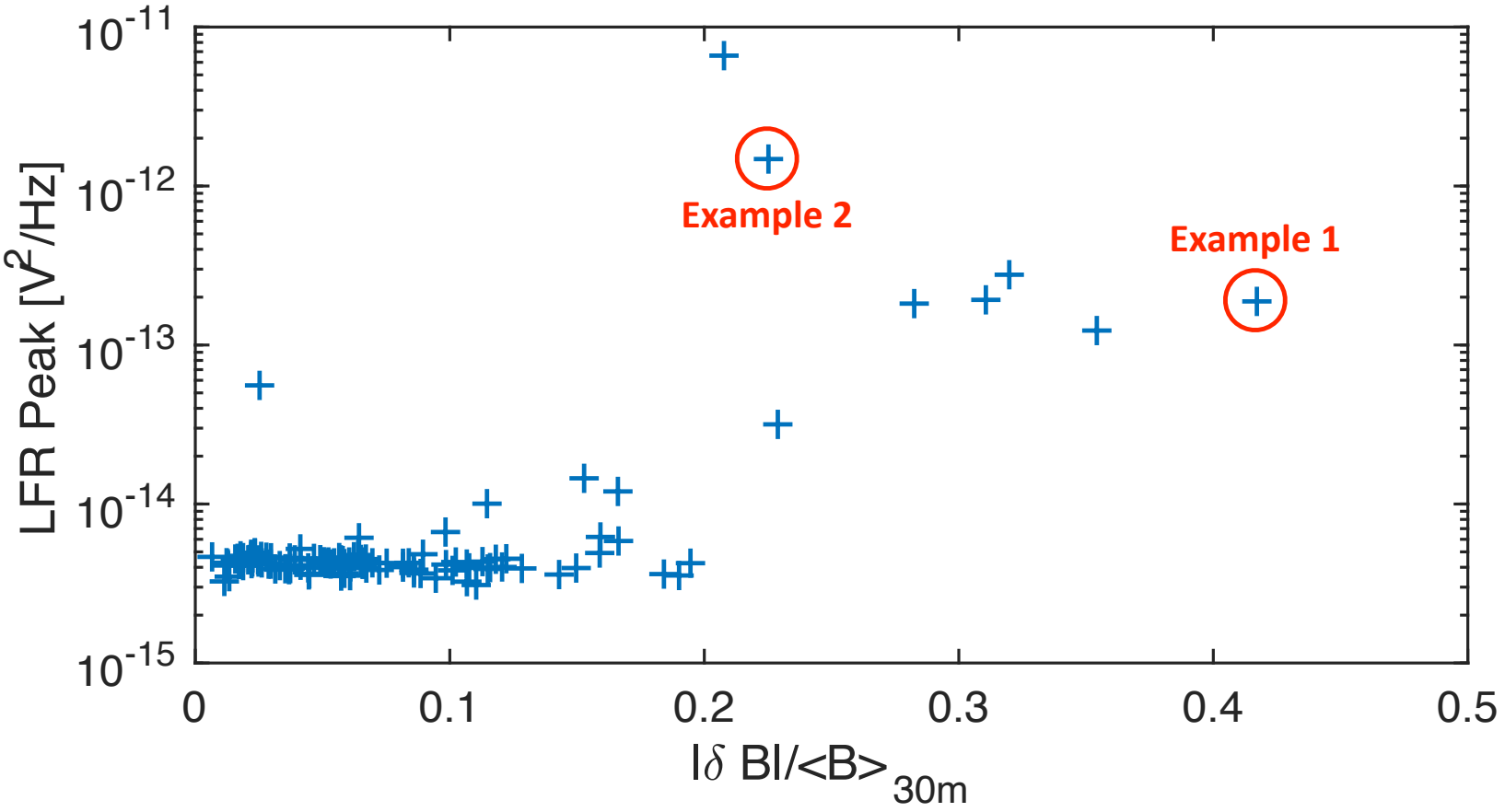
Example 1



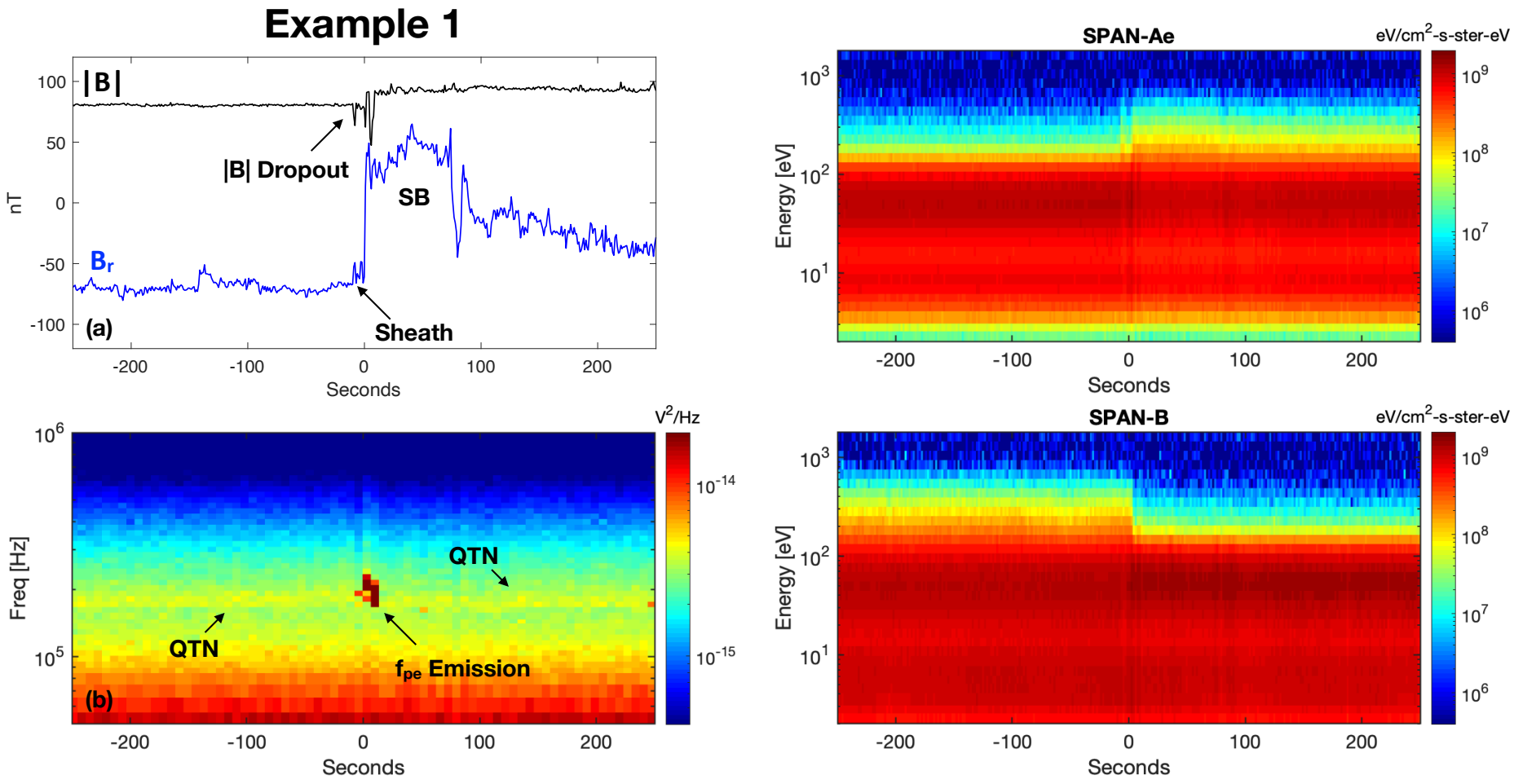
Example 2



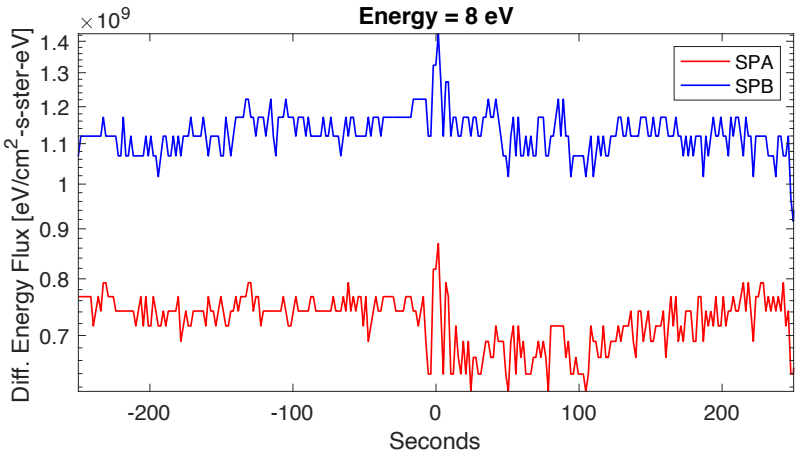
F_{pe} Emission Peak vs. B-Drop

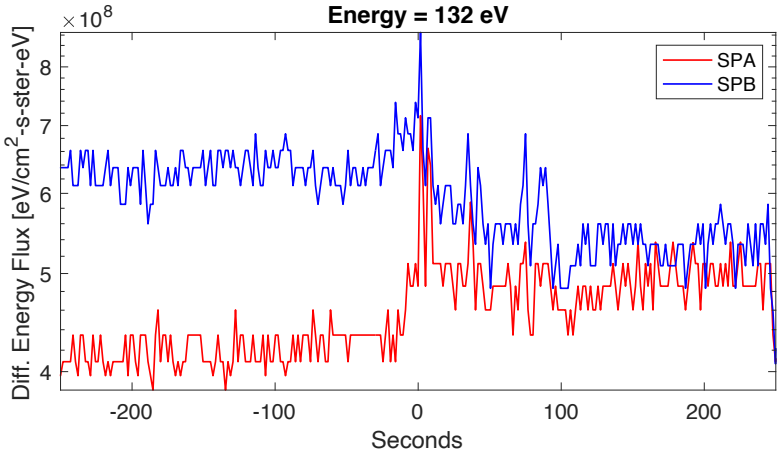


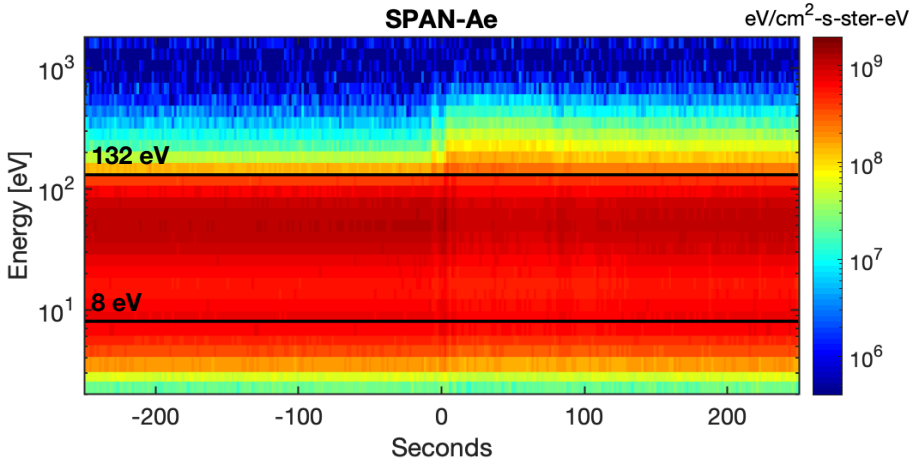
Comparing with SPAN-E Measurements

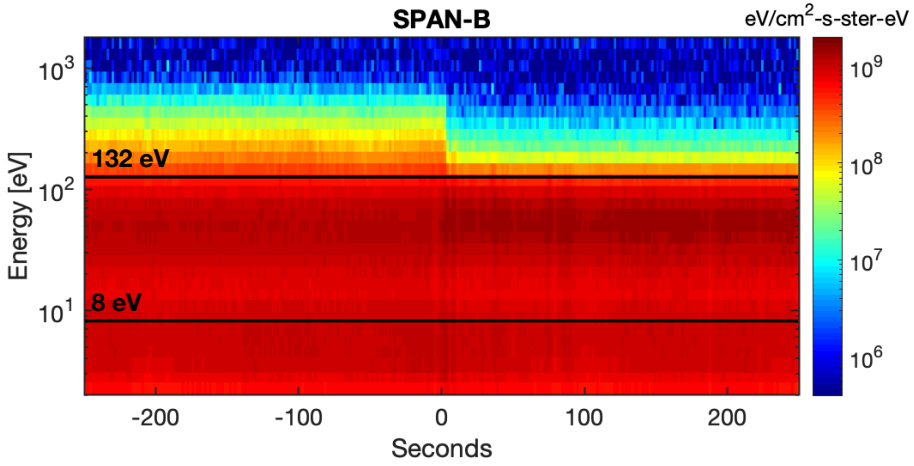


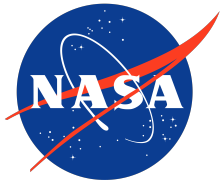
Comparing with SPAN-E Measurements











- Where we see the largest dropouts in IBI at SB boundaries, we also see signatures of f_{pe} emissions and enhanced electron flows

- What could this suggest?

  - Currents at the SB boundaries are giving rise to changes in the magnetic field
  - These same currents—possibly in the form of electron flows or beams—are also driving beam instabilities that stimulate plasma waves such as Langmuir wave

- Electron currents give rise to current-driven behavior at SB boundaries (with the SBs themselves being mostly Alfvénic [Matteini et al., Parker One, 2021])