Contribution ID: **52**

Type: **Invited talk**

Electron Acceleration in Solar Flare Reconnection

Wednesday, 26 May 2021 11:38 (25 minutes)

The details of electron acceleration in solar flares is still an open question. I will be presenting a brief overview on the observations and challenges before describing results from a new model. Electron distributions in solar flares typically take the form of a thermal core with a power law tail. These nonthermal electrons contain more energy than the thermal electrons in 85% of solar flares and have spectral indices ranging from ~3-6. Additionally, the nonthermal electrons produce hard x-rays through bremsstrahlung radiation when they thermalize in the chromosphere. This strong signal produced by nonthermal electrons makes understanding the energization process important for characterizing solar flares. Unfortunately, the huge separation between kinetic and macro scales makes simulating solar flares challenging. Recently, results from particle-in-cell simulations suggest that Fermi reflection is the dominant mechanism for electron energy gain. I will present results from a new model that includes this relevant kinetic physics but is valid in a macroscale system. Consistent with solar flare observations the spectra of energetic electrons take the form of power-laws that extend more than two decades in energy. The drive mechanism for these nonthermal electrons is Fermi reflection in growing and merging magnetic flux ropes. A strong guide field suppresses the production of nonthermal electrons by weakening the Fermi drive mechanism. For a weak guide field the total energy content of nonthermal electrons dominates that of the hot thermal electrons even though their number density remains small. Our results are benchmarked with the hard x-ray, radio and extreme ultra-violet (EUV) observations of the X8.2-class solar flare on September 10, 2017.

Primary author: ARNOLD, Harry

Co-authors: Dr DRAKE, James (University of Maryland College Park); Dr SWISDAK, Marc (University of Maryland College Park); Dr GUO, FAN (Los Alamos National Laboratory); Dr DAHLIN, Joel (NASA Postdoctoral Program Fellow at NASA Goddard Space Flight Center); CHEN, Bin (New Jersey Institute Of Technology); Dr FLEISHMAN, Gregory (New Jersey Institute of Technology); GLESENER, Lindsay (University of Minnesota); KONTAR, Eduard (University of Glasgow); Dr PHAN, Tai (University of California Berkeley); SHEN, Chengcai (Smithsonian Institution/Smithsonian Astrophysical Observatory)

Presenter: ARNOLD, Harry

Session Classification: Science question 3

Track Classification: Electron Energization