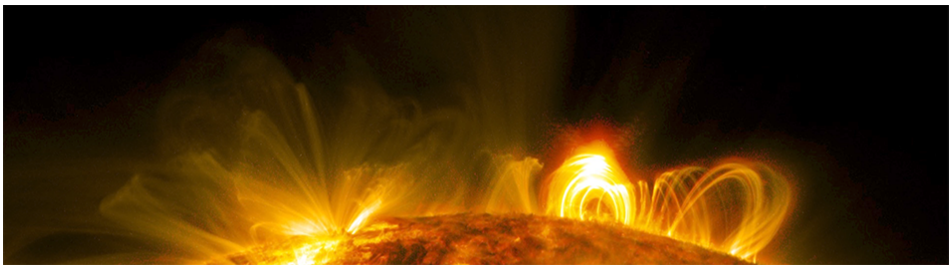

Contribution ID: **9** Type: **Poster**

Particle-in-cell simulation of sub-ion cyclotron frequency spectrum of circularly polarized dispersive Alfven waves in inhomogeneous solar flaring plasmas.

Thursday, 18 November 2021 09:45 (1 hour)

The observed soft X-ray flux during solar flares is produced by electron bremsstrahlung, when accelerated electrons that move from magnetic loop top to the footpoints slow down by dense layers of the sun. In order to explain the observed soft X-ray flux during solar flares, if electron acceleration happens at loop top, nearly 100% electrons need to be accelerated. No acceleration mechanism is known with such high efficiency. This problem can potentially be solved by postulating [Fletcher & Hudson, Astrophys. J. 675, 1645 (2008)] that flare at loop top creates dispersive Alfven waves (DAWs) which then propagate towards the footpoints, and as they move in progressively denser parts of the loop (due to natural gravitational stratification) the aforementioned high percentage is no longer needed. It has been known that, in homogeneous plasma, when perpendicular wavelength of Alfven wave (AW) approaches kinetic scales such as e.g. ion-inertial length, it acquires magnetic-field-aligned (parallel) electric field, which can efficiently accelerate electrons [Stasiewicz et al Space Sci. Rev. 92, 423 (2000)]. Further, Tsiklauri, Sakai, & Saito, Astron. Astrophys. 435, 1105 (2005) have shown that if DAW propagates in plasma with transverse (with respect to external magnetic field) density inhomogeneity, the generated parallel electric field is orders of magnitude higher than (i) homogeneous plasma case and (ii) Dreicer electric field (one that triggers electron run-away acceleration). Subsequently Tsiklauri Phys. Plasmas 19, 082903 (2012) has revisited the problem with full 3D particle-in-cell approach. Ofman JGR 115, A04108 (2010) considered similar set up as in Tsiklauri, Sakai, Saito (2005) but instead of considering one DAW harmonic with 0.3 ω_{ci} he considered f^{-1} AW cascade and added He++ ions and used Hybrid simulation model. Note that our approach uses PIC code so it can resolve electron-scale physics contrary to Ofman who used Hybrid code, which can resolve only ion-scale physics. Now in the present work we essentially revisit Ofman's set up run it for two cases 1. when transverse density gradient is ~c/ω_{ci} (as in Tsiklauri, Sakai, Saito (2005) and Tsiklauri (2012)), i.e. on "electron"-scale; 2. when the gradient is on ion scale circa 40 c/ω_{ci} (as in Ofman (2010)) i.e. on "ion"-scale; In this presentation novel numerical simulation results will be presented. Including the scaling of the magnetic fluctuations power spectrum steepening in the higher-density regions, and the heating channelled to these regions from the surrounding lower-density plasma due to wave refraction, as originally found by Ofman (2010).

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