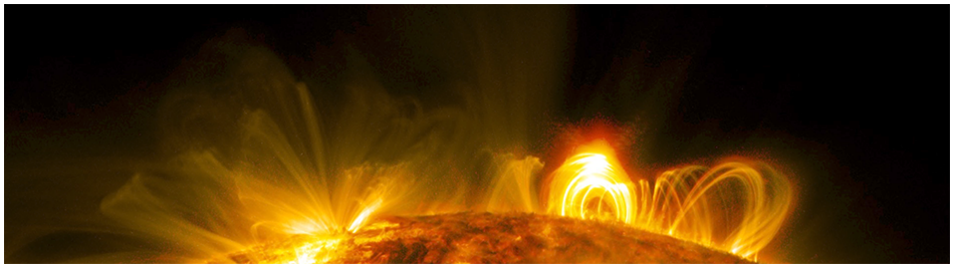

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Low-energy Cutoff of Non-thermal Electrons estimated from a Spectro-polarimetric Observation

Monday, 15 November 2021 12:45 (15 minutes)

Low-energy cutoff of the non-thermal electron energy distribution is crucial to derive the total non-thermal electron energy. A flare kernel associated with a C4 class flare was observed in a spectral window including the He I triplet 1083.0 nm and Si I 1082.7 nm with a spectro-polarimeter on the Domeless Solar Telescope at Hida Observatory on 2015 August 9. The observed Stokes profiles of the He I triplet in the flare kernel are well reproduced through inversions considering the Zeeman and the Paschen-Back effects with a three-slab model of the flare kernel. One slab of them produces an absorption, while the others produce emissions with upward and downward velocities. The magnetic field strength inferred from the emission components of the He I line was 1400 G, which is significantly stronger than 690 G that was observed at the same location in the same line 6.5 hr before the flare. In addition, the photospheric magnetic field vector derived from the Si I10827 Å was similar to those of the He I emissions. To explain this result, we suggest that bombardment of non-thermal electrons leaded to the formation of a coronal temperature plasma around a formation layer of the photospheric Si I line, and then the emission in the He I triplet was produced in the deep layer. Assuming an umbral atmospheric model and a power-law index of non-thermal electron energy distribution, we derived the low-energy cutoff of the non-thermal electron as 20-30 keV from the location where the He I emissions were formed.

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