Heating of a coronal loop by trapped high-energy electrons in solar flares

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An X-class flare, occurring near the west limb on 30 September 2000, was well observed with the Yohkoh satellite and Nobeyama Radio Heliograph. During this flare, an expanding (or eruptive) loop-like structure appeared above the flare main loop in soft X-rays. The soft X-ray intensity of the expanding loop continuously increased after the soft X-ray intensity of the flare loop began to decrease. At the same phase, nonthermal microwave emission was detected in the expanding loop. This long-lasting increase in soft X-ray intensity could be due to gradual precipitation of high-energy electrons trapped in this expanding loop. In this presentation, this scenario is quantitatively discussed. In order to make this long-lasting precipitation, it is necessary to increase the number of high-energy (a few hundreds keV - a few MeV) electrons and/or to prevent them from precipitating into the footpoint region. As for the former, we can derive the energy-spectrum of electrons below 100 keV from hard X-ray observations. However, we don’t have any information above 100 keV. So the first parameter is the power-law spectral index of high-energy electrons above 100 keV. As for the latter, the parameter is the loss-cone angle of this expanding loop. We change these two parameters and try to reconstruct the observational time profile in soft X-rays. It is found that the first parameter, the electron spectral index, does not affect the time profile so much and the second parameter, loss-cone angle, controls the time profile in soft X-rays.