A new approach for studying particle acceleration at solar flares

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Particle acceleration at solar flares has been an outstanding problem despite the years of intensive research. While magnetic reconnection has been widely accepted as the energy release model of the solar flares, the detailed process of acceleration associated with magnetic reconnection is still unclear. RHESSI spacecraft has made many important results, but the mechanism of acceleration remains to be solved.

The details of particle acceleration has been discussed mainly by theoretical studies. Various candidates of acceleration region such as magnetic reconnection region and loop-top regions have been studied by many approach. Some examples of the approach are test-particle approximation and statistical ones which solve the Fokker-Plank equation. In these studies, wave-particle interaction and back-reaction

from energetic particles have been incorporated. However, there has been no study which combines each of the above elements. Hence, the coupling between macro-scale and micro-scale should be a major interest in the future solar flare studies.

To this end, we perform full-particle simulation. In order to study not only magnetic reconnection but also other ambient regions, we set symmetric boundaries to imitate interaction between outflows and magnetic pile-up regions. There is of course a large scale gap between the parameters of our simulation box and the solar corona. We discuss a possibility of applying a scaling-law.