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宇宙プラズマ中の渦乱流内で起こる磁気リコネクションによる電子加速

High reconnection rate and associated strong electron acceleration in the vortex-induced-reconnection process

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Magneto-hydrodynamic (MHD) turbulence has often been observed in various regions of space. The MHD turbulence has been an important candidate for the source of non-thermal, high-energy particles. For direct understanding of the particle acceleration process in MHD turbulence, kinetic simulations are necessary to be performed. However, it is impossible to directly solve a large-scale MHD-turbulence by kinetic simulations. Thus, in this study, we performed full particle simulations on an element of a developed turbulence, that is, a vortex, and tried to predict how particles are accelerated in the turbulence. As a result, we found that magnetic reconnection driven by the vortex flow (so-called the vortex-induced-reconnection) can cause the anomalously strong electron acceleration. This is because the reconnection rate of the dynamic vortex-induced-reconnection process is anomalously higher than that of the static reconnection process. In this presentation, we will show the results of a parameter survey of the degree of the electron acceleration for the size of the vortex, and discuss how electrons are accelerated in a developed turbulence, which consist of the various-scale vortices.

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