An anomalous resistivity in collisionless driven reconnection and its role in multi-hierarchy system

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Many particle simulation studies [1,2] have revealed that frozen-in condition is broken due to particle kinetic effects and collisionless reconnection is triggered when current sheet is compressed as thin as ion kinetic scales under the influence of external driving flow. A reconnection system evolves into a quasi-steady state after an initial transient phase if the driving flow satisfies some condition [1]. In the steady state, reconnection electric field generated by microscopic physics evolves inside ion meandering scale so as to balance the flux inflow rate at the inflow boundary, which is controlled by macroscopic physics. That is, effective resistivity generated through this process can be expressed by balance equation between micro and macro physics. On the other hand, because such a microscopic kinetic system is always imbedded in a global microscopic system and its location varies in both time and space, it is very important to locate a kinetic regime in a dynamically evolving macroscopic system and clarify the role of kinetic effect in the global reconnection phenomena through the interaction between macro and micro physics. For this purpose we apply this effective resistivity model to magnetic reconnection phenomena in the Earth magnetosphere as atypical multi-hierarchy system. In case of southward solar wind magnetic field with an oblique component, intermittent plasmoid ejection was observed in the night-site region of the magnetosphere as a result of magnetic reconnection around 10-20 of the earth radius.

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