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Studies on collisionless driven reconnection with a multi-hierarchy simulation model SHUNSUKE USAMI, HIROAKI OHTANI, RITOKU HORIUCHI, NIFS, MITSUE DEN, NICT — Collisionless magnetic reconnection is believed to play an essential role in the rapid energy release such as solar flares and geomagnetic substorms. Also, reconnection process attracts considerable attention as coupling phenomenon between multiple spatial and temporal scales. A grand challenge in reconnection studies is to understand its multi-hierarchy structure. Then, a multi-hierarchy simulation model, which deals with both microscopic and macroscopic physics consistently and simultaneously, is developed. Our multi-hierarchy model is based on the domain decomposition method, which the domains differ in algorithm. Physics in the domain where microscopic kinetic effects are important is solved by PIC algorithm (PIC domain), while dynamics outside the PIC domain is expressed by MHD algorithm (MHD domain). Between the PIC and MHD domains, an interface domain with a finite width is inserted in order to interlock two domains smoothly. We first connect the PIC and MHD domains at the upstream boundary. We have successfully demonstrated that plasmas come from MHD to PIC domains and drive magnetic reconnection in the PIC domain [1]. Next, we would consider the connection at the downstream boundary.

[1] S. Usami, H. Ohtani, R. Horiuchi, and M. Den, Plasma Fusion Res. 4, 049 (2009).

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