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Energy release by the magnetic reconnection with finite fluctuations

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Abstract. The magnetic reconnection is one of the fundamental processes for the heating, bulk flow acceleration, and magnetic topology change observed by the telescopes onboard Hinode. For the quantitative understanding of these phenomena, it is crucially important to determine the energy release rate or, equivalently, the reconnection rate from theoretical/numerical studies. Owing to the enormously large magnetic Reynolds number, it is expected that the MHD turbulence or some stochastic process may play a role for the magnetic diffusion in the reconnection region. By performing three-dimensional MHD simulations, we are working on this issue. The temporal evolution of a simple current sheet with initially imposed fluctuations in the resistivity is studied. A substantial increase of energy release rate was found by adding the guide field, i.e. the field parallel to the electric current. It is interpreted that this is due to the mutual interactions of magnetic islands formed in a spatially-separated parallel resonant layers.