Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Effects of a toroidal shear flow on magnetic reconnection[1] XIAOGANG WANG, Peking University, JIAQI WANG, Dalian University of Technology, China — In laboratory plasmas, a toroidal shear flow V_z can be generated by neutral beam injections (NBI), and in space plasmas, the shear flow V_z perpendicular to the anti-parallel magnetic fields B_y, such as in the magnetosphere plasma, are also observed often. Nevertheless, though magnetic reconnection with a poloidal shear flow V_y, i.e., a flow parallel or anti-parallel to the equilibrium poloidal field, has been studied in space and laboratory plasmas for years, the effect of a toroidal shear flow on magnetic reconnection attracts little attention, since in a two-dimensional geometry the out-of-plane toroidal flow V_z has been thought no effect on the in-plane reconnection process. However, our study on the problem finds that the toroidal shear flow generates a bipolar structure of the perturbed B_z field that excites Alfvén waves downstream away from the reconnection region. Also particularly in collisionless Hall MHD reconnection regime that is often the case in space plasmas, the bipolar structure destroys the quadruple distribution of the B_z field generated by the low frequency whistler modes. The consequence of the effects to tearing modes in tokamaks and collisionless reconnection in space plasmas is also discussed.

[1]This work is supported by NSFC.

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Date submitted: 25 Jul 2007 Electronic form version 1.4