Effects of a toroidal shear flow on magnetic reconnection\textsuperscript{1} XIAO-GANG 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.

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