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Effects of Ion Landau Damping and Vortex Generation on the Kinetic Internal Kink Model[1] HIROSHI NAITOU, KEIICHI ISHIDA, KENJI ISHIDA, Yamaguchi University, JEAN-NOEL LEBOEUF, UCLA, MASATOSHI YAGI, Kyushu University, S. TOKUDA, JAEA — As the MHD phenomena in tokamaks enter into the collisionless regime, needs for the kinetic (or extended) MHD simulation have been increased. The simulation model in this article includes electron inertia, diamagnetic effect, and ion Landau damping. To simulate the m=1 and n=1 internal kink mode, the collisionless skin depth (d_e ∼1mm) which is three orders of magnitude smaller than the minor radius is resolved. The results are summarized as follows: (1) As the pressure gradient increases the internal kink mode (IK mode) is stabilized by the diamagnetic effects but the new mode appears with the smaller growth rate and with the frequency of drift wave (DIK mode). There is a stability window between unstable regions of both modes if the ion Landau damping is included. (2) DIK mode can also cause full magnetic reconnection. The linear mode pattern of the DIK mode is basically similar to that of the IK mode but has a strong poloidal shear flow to generate small vortices in the nonlinear stage due to the Kelvin-Helmholz like instability. There appears turbulent region due to the nonlinear coupling of vortices. The DIK mode is first stabilized by the excitation of vortices but later it is destabilized with enhanced growth rate.

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