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Two Fluid collisionless simulations on the Kelvin - Helmholtz instability and vortex induced inertial reconnection in the external region of the magnetotail

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The last few years have seen a growing interest in the transport and dynamical properties of the external region of the earth magnetotail. In the ecliptic plane the boundary region between the internal magnetosphere and the external solar wind presents a sheared velocity field and a nearly perpendicular magnetic field. In this context, the Kelvin-Helmholtz instability may play a key role in the transport properties of the plasma from the outside solar wind to the inside magnetosphere.

Several MHD, one-fluid, studies have been performed in order to investigate the role of the KH instability in the fluid limit and of the induced dynamics in the presence of a weak parallel magnetic field by including a resistive correction to the ideal Ohm's law.

We use a two-fluid numerical model including electron inertia effects in order to investigate collisionless magnetic reconnection induced by the KH vortex of the (weak) parallel component of the magnetic field. The modification of magnetic field lines topology allows the particles to reach initially forbidden regions and thus deeply modifies the transport properties of the entire boundary region.