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Turbulent lobe/mantle formed by coherent vortices in the near-Earth magnetotail

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During the near-Earth magnetotail compression due to the enhanced dynamic pressure of solar wind on August 24, 2005,TC-1 satellite observed a turbulent near-Earth lobe/mantle that consists alternately of the dense-hot mantle-like ions (Ni>1 /cm3, 300eV<Ti<500eV) and the tenuous-cool lobe ions (Ni<1 /cm3, 20eV<Ti<300eV). In the dense-hot mantle-like regions, the prominent 'loops' of ion bulk flow velocity vector and out-of-phase perturbations between the different velocity-components indicate the existences of flow vortices. The flow vortices cause not only the increases of ion number density and temperature, but also the twist of magnetic field and the expulsion of magnetic flux, In contrast to the inside of the vortices, outside the vortices the properties of the ions and magnetic field maintain relatively unperturbed lobe characteristics due to the absence of vortex motion. Thus from the inside to outside of the vortices, the feature changes of the ions and magnetic field produce a turbulent lobe/mantle in the near-Earth magnetotail.