# Vlasov simulation of the interaction between the solar wind and a dielectric body with magnetic anomaly

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The interaction of a plasma flow with an unmagnetized object is quite different from that with a magnetized object such as the Earth. Due to the absence of the global magnetic field, the unmagnetized object absorbs plasma particles which reach the surface, generating a plasma cavity called wake in the anti-solar side of the object. Since the velocity of the solar wind (SW) is larger than the thermal velocity of ions, ions cannot penetrate into the nightside of the moon. However, ions were observed in the deep wake by a Japanese spacecraft KAGUYA (SELENE) which is orbiting the moon in a polar orbit around 100km altitude. A key mechanism of this phenomenon is thought to be scattering of SW ions at the lunar dayside surface by an interaction between the Interplanetary Magnetic Field (IMF) and a lunar magnetic anomaly. In the present study, we examine structure of the wake due to the interaction between IMF and the magnetic anomaly via a full-kinetic Vlasov simulation.

We performed one of the first global Vlasov simulations of magnetosphere. We assumed a 2.5D Cartesian system in which spatial grids are taken in the 2D plane and velocity grids are taken in 3D space. There exists an insulative sphere, in which the charge accumulates at the surface. The intrinsic magnetic field of the object as the magnetic anomaly is assumed to be the 2D dipole magnetic field. The solar wind also carries an IMF.

The simulation results suggest that the magnetic anomaly on the dayside surface of the moon would affect to the formation of the wake field. The structure of plasma void is modified by the convection of magnetic field motion.