



## **Diamagnetic effect in the forenoon solar wind observed by Kaguya**

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Direct interaction between the lunar surface and incident solar wind is one of the crucial phenomena of the planetary plasma sciences. Recent observations by lunar orbiters revealed that strength of the interplanetary magnetic field (IMF) at spacecraft altitude often increases over crustal magnetic fields on the dayside. In addition, variations of the IMF on the lunar night side have been reported in the viewpoint of diamagnetic effect around the lunar wake. However, few studies have been performed for the IMF over non-magnetized regions on the dayside. Here we show an event where strength of the IMF decreases at 100 km altitude on the lunar dayside (i.e. in the forenoon solar wind) when the IMF is almost parallel to the incident solar wind flow, comparing the upstream solar wind data from ACE with Kaguya magnetometer data. The lunar surface below the Kaguya orbit is not magnetized (or very weakly magnetized), and the sunward-travelling protons show signatures of those back-scattered at the lunar surface. We find that the decrease in the magnetic pressure is compensated by the thermal pressure of the back-scattered protons. In other words, the IMF strength in the forenoon solar wind decreases by diamagnetic effect of sunward-travelling protons back-scattered at the lunar dayside surface. Such an effect would be prominent in the high-beta solar wind, and may be ubiquitous in the environment where planetary surface directly interacts with surrounding space plasma.