

Velocity of ions refilling the lunar wake observed by Kaguya

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The solar wind particles that hit the moon are absorbed by the lunar surface, creating the plasma void region called the lunar wake. The ambient solar wind refilling the wake was thought to have the speed of the order of ion acoustic speed, but much faster ions were observed in the wake by Chandrayaan and Kaguya [1][2]. Ion velocity structure in the lunar wake was constructed on the basis of ARTEMIS observation [3], but the orbit of the spacecraft was somewhat inconvenient to study the near wake.

In this study, we use Kaguya observation to study the velocity evolution of ions refilling the wake. We employ ion momentum data obtained by IMA and IEA sensors of MAP-PACE in the lunar wake during the period from December 21, 2007 to June 10, 2009, to produce a map of velocity structure in the near wake. The map shows ions with velocities of the order of several hundred km/s much higher than the ion acoustic speed just after the crossing of the wake boundary.

[1] Futaana et al., JGR 115, (2010), doi:10.1029/2010JA015264

[2] Nishino et al., EPS 74, 9 (2022), doi.org/10.1186/s40623-021-01566-2

[3] Zhang et al., 2014, JGR 119, (2014), doi:10.1002/2014JA020111

Keywords: moon, solar wind, wake, ion, velocity, Kaguya