



## **Direct observations of a mini-magnetosphere in the lunar plasma wake**

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In this report, we present direct observations of a mini-magnetosphere when ARTEMIS P2 is passing through the lunar wake, where the lunar surface and crustal fields are shielded from the solar wind flows. We find the magnetic field amplification simultaneously with the dropout of plasma density and particle energy fluxes when the orbit of P2 is just over the margin of Imbrium antipode anomaly which is centered at 162° E, 33° S. The observational interval of these characteristic features is merely 95 seconds (from 1413:15 UT to 1414:50 UT on December 9th 2012) and the orbit altitude of P2 is ~226 km. The strength of magnetic field at P2 orbit altitude (~226 km) can reach ~9 nT over the anomaly region compared to the relatively small value of ~6 nT in the neighboring regions. In addition to these, we also detect the moderate ion and electron temperature increase inside the mini-magnetosphere as well as the rotation in the magnetic field direction near the boundary of mini-magnetosphere. These field and plasma parameters demonstrate that the vertical size of the mini-magnetosphere near lunar surface can at least extend to ~230 km in the near-vacuum lunar wake without the interaction with the solar wind. We also try to explain the detailed plasma dynamics performed within this mini-magnetosphere by dipole model or non-dipolar model. This study may open up a new view of studying lunar mini-magnetosphere by spacecraft observations in the lunar wake where magnetic anomaly fields are almost undisturbed.