Opportunities for plasma physics experiments on the new lunar orbiting manned international space station

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In 2023 the first element of a new international space station is to be launched. The Lunar Orbital Platform-Gateway (LOP-G), or Deep Space Gateway (DSG) will orbit the Moon rather than the Earth [1]. The purpose of the Gateway is to acclimatise crew and technology for long durations and radiation exposure of deep-space missions far from the Earth.

The Gateway will offer the opportunity to deploy additional plasma instrumentation on 'cube' or 'nano' satellites. Previous work [2] has shown how features like the lunar crustal magnetic anomalies can be used as natural laboratory-type experiments in space due to the number of in-situ missions that have made observations and the fixed footprint of the magnetic field sources.

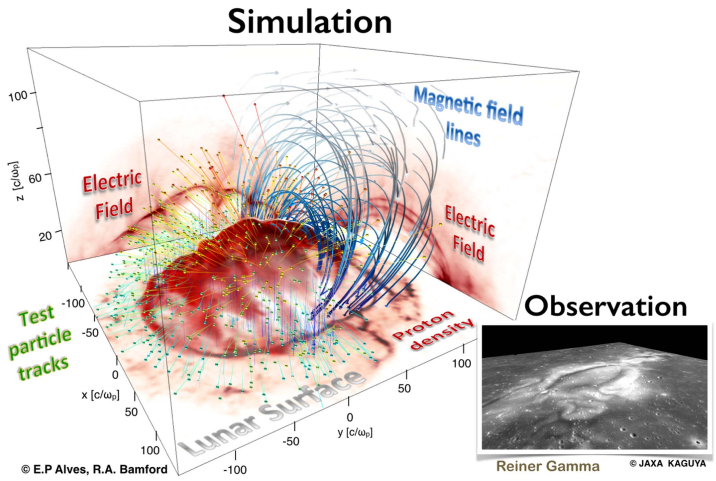

Figure 1: *A 3D particle-in-cell simulation of collisionless shock and diamagnetic cavity formation at lunar magnetic anomalies with typical in-situ spacecraft trajectory. Insert: A lunar 'swirl' [2]*

The Gateway will offer the opportunity to conduct active and passive plasma physics experiments in a low density, collisionless plasma environment. Active plasma experiments are also being considered.

In this presentation I will outline some interesting ideas and topics that will take advantage of this opportunity to investigate plasmas far from equilibrium.

References

[1] NASA updates Lunar Gateway plans. (Sept (2018).
[2] Bamford, R. A., et al. ApJ 830.2 (2016): 146.