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Modelling auroral currents at hot Jupiters: implications for auroral radio emissions

J. D. Nichols and S.E. Milan
University of Leicester, Leicester, UK (jdn@ion.le.ac.uk).

Abstract

Recently, the radio emissions of exoplanets have come under focus due to the commencement of observations using new radio telescopes such as LOFAR. A class of planet which has attracted significant attention in this respect is the close-orbiting 'hot Jupiter', several of which, according to previous estimates, may produce detectable radio emissions driven by stellar wind-magnetosphere interactions. However, this expectation rests on the accuracy over many orders of magnitude of the 'Radiometric Bode's Law', an empirical relation between the solar wind energy input and radio power output of a variety of bodies in the solar system, some of which (e.g. Jupiter) are known to be dominated instead by internal processes such as planetary rotation. In this presentation we calculate the expected radio luminosity generated by a Dungey cycle-like stellar wind interaction with a hot Jupiter's magnetosphere. Specifically, we adapt the *Milan* (2013) model of the terrestrial twin-vortical ionospheric plasma flow and resulting field-aligned currents to the case of hot Jupiters, and we compute the total auroral and radio luminosities for various parameters and compare with previous empirical estimates.

References

Milan, S., Modeling birkeland currents in the expanding/contracting polar cap paradigm, *Journal of Geophysical Research: Space Physics*, *118*(9), 5532–5542, 2013.