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Electrodynamic Heating of Jupiter's Great Red Spot Thermosphere

Licia C. Ray (1), Christopher T. S. Lorch (1), James O'Donoghue (2), Japheth N. Yates (3), Sarah V. Badman (1), Christopher G. A. Smith (4), and Thomas S. Stallard (5)
(1) Lancaster University, Lancaster, UK (licia.ray@lancaster.ac.uk), (2) NASA / GSFC, (3) ESA / ESAC, (4) Brooksbank School, West Yorkshire, UK, (5) Leicester University, Leicester, UK

Abstract

Recent observations of Jupiter's Great Red Spot indicate that the thermosphere above the storm is hotter than its surroundings by more than 700 K. Possible suggested sources for this heating have thus far included atmospheric gravity waves and lightning-driven acoustic waves. Joule heating, driven by Great Red Spot vorticity penetrating up into the lower stratosphere and coupling to the thermosphere, may contribute to the large observed temperatures. The strength of Joule heating will depend on the local inclination angle of the magnetic field and thus the observed emissions and inferred temperatures should vary with planetary longitude as the Great Red Spot tracks across the planet. We derive estimates for the Joule heating rate as a function of GRS longitude and discuss in the context of H3+ observations.