

Io's auroral footprints: Constraining Io's Alfvén wings

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Abstract

The electromagnetic interaction between Jupiter and its innermost Galilean moon Io is a prime example for moon-planet and star-planet interaction. A very striking feature is the Io Foot Print (IFP) in Jupiter's upper atmosphere.

With the Juno spacecraft orbiting Jupiter, new insights about the complex structure of the IFP have been achieved [1,2] which can not be fully explained by the current models. A deeper understanding is necessary to explain current observations. For that purpose we created a simple model of the inner Jovian magnetosphere that consists of the latest magnetic field model by [3] and a plasma density model to fit observational data [4]. The model somewhat similar to [5] was first used to calculate the propagation of the Alfvén waves in the Alfvén wings. Also included are reflections at the Io torus boundary that lead to the multiplicity of the IFP. With the help of this model, the leading angle between the IFP and Io's orbital position can be calculated which coincides with the measurement values. Furthermore, the inter-spot distance between footprints created by the Main Alfvén Wing, Reflected Alfvén Wing or by Transhemispheric Electron Beams (TEB) could also be computed and compared to the observations.

This model will serve as a basis to study the propagation of Io's Alfvén wings with MHD models.

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References

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