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Correlation between Io's lead angle and the satellite's magnetic footprint

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This research studies on the nature of aurora feature on Jupiter, especially the aurora that connects to its satellite, Io. Jupiter has a large magnetosphere, as a result of strong magnetic field strength. This magnetosphere corotates with Jupiter and extends over all of Galilean satellites. The interaction between Jupiter's rotating magnetic field and Io cause plasma particles to flow along the magnetic field line in directions toward both north and south hemispheres. Some particles will penetrate into Jupiter's ionosphere and collide with atmosphere particles, leading to aurora emission, at the position of Io's footprint. Io is surrounded along its path, by a cloud of plasma particles with high density, which is called Io torus. This torus enhances the effect of bending magnetic field lines when they pass Io and result in inaccuracy of the prediction of longitudinal position of Io footprint. This shift of longitudinal prediction can be mapped to the shifted position of Io, which is called lead angle. Our objective is finding the relation between all three parameters, which are magnetic field strength, Io footprint brightness and lead angle at the same Io footprint position or the same Io longitude. We use VIPAL magnetic field model, develop by Hess et al. (2011) to trace along the magnetic field line and finding magnetic field strength at any given position. This tool is vital for determination of the relation between magnetic field strength, Io footprint brightness and lead angle.

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