# C38 - Dawn-Dusk Asymmetry of the Io Plasma Torus Derived From Io's Auroral Footprints Observed by Juno-UVS

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## Abstract

The Io plasma torus (IPT) is a dense plasma cloud that corotates with Jupiter along Io's orbit. A dawn-to-dusk electric field shifts the IPT dawnward, which is closely related to the global structure of the Jovian magnetosphere and the M-I coupling. The shift orientation has been measured in the past, while the geometry of Earth-based observations allows to measure only the dawn-dusk component of the electric field.

This study probes the dawn-dusk asymmetry of the Io plasma torus using Io's auroral footprints. The position of the Io footprint corresponds to the travel time of the Alfvén waves that propagate from Io to Jupiter, which depends on the local plasma mass density along the magnetic field line. By modeling the Alfvén wave propagation from Io, we retrieve the flux tube mass content (FTMC) – the total ion mass density integrated along the magnetic flux tube – from the footprint lead angle measured by Juno-UVS. While the FTMC is a function of both ion mass density and temperature, these two quantities are degenerate and cannot be disentangled using the lead angle alone. Therefore, the FTMC provides a robust proxy for variability in the plasma mass at Io's orbit.

The retrieved Io-FTMC is strongly correlated with Io's local time (LT) in the magnetosphere. A larger FTMC is found in the morning sector of the magnetosphere, which is due to the plasma torus being shifted by the dawn-to-dusk electric field. Furthermore, the peak Io-FTMC found at 03:42±00:53 LT suggests that the dawn-to-dusk electric field is oriented toward a predusk direction, in contrast to the previous studies that placed it near the true dusk or postdusk.

The estimated dawn-to-dusk electric field is 3.0–20.0 mV/m, with an upper limit exceeding the previously-observed values. This may reflect temporal variations in the solar wind dynamic pressure and in the local plasma conditions driven by Io's volcanic activity over the Juno epoch.