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Addressing the steady and dynamical states of Jupiter's synchrotron radiation from 3D image reconstructions

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Abstract

The tomographic-like technique introduced twenty years ago by Sault et al. [Astron. Astrophys., 324, 1190-1196, 1997] permitted the first 3-dimensional mapping of Jupiter's synchrotron radiation brightness distributions around the planet. This technique has proven to be very valuable for refining Jupiter's planetary magnetic field models or examining the temporal and spatial changes of its synchrotron radiation. We here present our modeling effort to improve 3D image reconstruction techniques and address isotropy assumptions made in the early reconstruction methods. We discuss our image reconstruction results for different bands and observation periods in order to investigate, in the near future, the parameters that control the time and spatial variability of Jupiter's synchrotron emission that occurs on short time scales during observations. We discuss how our 3D tomographic reconstruction method (1) provides new model constraints on the energy and spatial distributions of Jupiter's ultra-relativistic electrons close to the planet and (2) can be used to interpret Juno MWR observations of Jupiter's electron-belt emission and assist in evaluating the background noise from the radiation environment in the atmospheric measurements.

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