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# Updated modeling of Io and non-Io Radio Auroral Emissions of Jupiter

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## Abstract

The radio auroral emissions produced by the Jupiter's magnetosphere between a few kHz and 40MHz, the most intense of our Solar System, are known since half a century, but they still drive many questions, and their deepened study is one of the main aim of the JUNO missions (arrival in July 2016). Jovian auroral radio emissions are thought to be produced through the Cyclotron Maser Instability (CMI), from non-maxwellian weakly relativistic electrons gyrating along high-latitude magnetic fields lines (Zarka, 1998). These emissions divide in different spectral components, driven or not by the moon Io. The origin and the relationship between kilometric, hectometric and decametric non-Io emissions in particular remains poorly understood.

To investigate these emissions, we simulated numerical dynamic spectra with the most recent version of the ExPRES code - Exoplanetary and Planetary Radio Emission Simulator, available at http://maser.obspm.fr - already used to successfully model Io decametric and Saturn's kilometric arc-shaped emissions (Hess et al., 2008, Lamy et al., 2008) and predict exoplanetary radio emissions (Hess et al., 2011). Such simulations bring direct constraints on the locus of active magnetic field lines and on the nature of CMI-unstable electrons (Hess et al., submitted). We validated the new theoretical calculation of the beaming angle used by ExPRES, which now includes refraction at the source. We then built updated simulations of Io and non-Io emissions which were compared to the radio observations acquired by the Cassini spacecraft (Jupiter flyby in 2000) and the Nançay decameter array (routines observations of Jupiter).

## 1. Figure

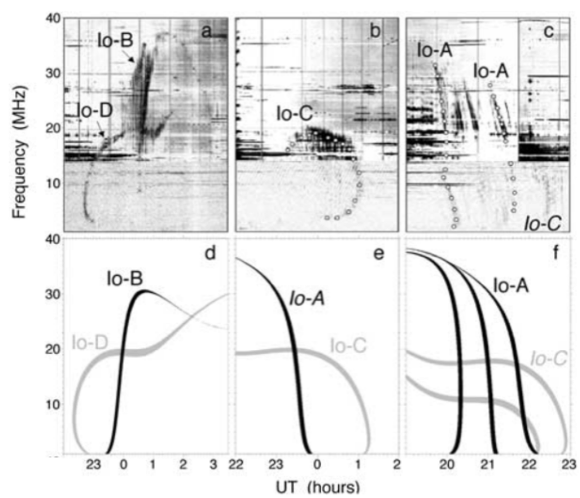


Figure 1: (a, b, c) Dynamic spectra of typical Io-Jupiter arcs observed by Wind/Waves and the Nancay decameter array. (d, e, f) Dynamic spectra of Io-Jupiter emissions for the same t-f intervals as in Figures 3a, 3b, and 3c, simulated by the ExPRES code using actual observing geometries (Black arcs are generated in the northern hemisphere and grey in the southern one. Labels in italics indicate weak or unobserved arcs.

# References


[1] Zarka, P. (1998), Auroral radio emissions at the outer planets, Journal of geophysical research, VOL. 103, NO. E9, PAGES 20,159-20,194, August 30, 1998

[2] Hess, S., B. Cecconi, and P. Zarka (2008), Modeling of Io-Jupiter decameter arcs, emission beaming and energy source, Geophys. Res. Lett., 35, L13107, doi:10.1029/2008GL033656.

[3] Lamy, L., P. Zarka, B. Cecconi, S. Hess, and R. Prange (2008), Modeling of Saturn kilometric radiation arcs and equatorial shadow zone, J. Geophys. Res., 113, A10213, doi:10.1029/2008JA013464.

[4] S. L. G. Hess and P. Zarka (2011), Modeling the radio signature of the orbital parameters, rotation, and magnetic field of exoplanets, A&A 531, A29, doi:10.1051/0004-6361/201116510.

[5] S. L. G. Hess, P. Zarka, B. Cecconi, and L. Lamy (submitted), ExPRESS : a tool to simulate planetary and exoplanetary radio emissions, A&A