Juno reveals new insights into Io-related decameter radio emissions

Yasmina M Martos$^{1,2}$, Masafumi Imai$^3$, John E.P. Connerney$^{1,4}$, Stavros Kotsiaros$^5$, and William S. Kurth$^6$

$^1$NASA Goddard Space Flight Center, Greenbelt, MD, USA (yasmina.martos@nasa.gov)
$^2$University of Maryland College Park, College Park, MD, USA
$^3$National Institute of Technology (KOSEN), Niihama College, Ehime, Japan
$^4$Space Research Corporation, Annapolis, MD, USA
$^5$Technical University of Denmark, Lyngby, Denmark
$^6$University of Iowa, Iowa City, Iowa, USA

The Juno spacecraft has been orbiting Jupiter since July 2016 providing stunning new information about the planet and its environment. The new magnetic field model, JRM09, with much improved accuracy near the planet, provides the basis for a better understanding of Io-related decametric radio emissions and implications for auroral processes. Here, we study Io-related DAM events observed by the Juno Waves instrument to estimate the beaming angle, the resonant electron energy and radio source location by forward modeling. The JRM09 magnetic field model is used to better constrain the location and observability of the radio emissions, and characterize the loss cone-driven electron cyclotron maser instability. We obtained good agreement between synthetic and observed arcs. The estimated beaming cone half-angles range from 33° to 85° and the obtained resonant electron energies are up to 23 times higher than previously proposed. Additionally, we quantitatively analyze the higher likelihood of observing groups of arcs originating in the northern hemisphere relative to those originating in the southern hemisphere. This is primarily a consequence of the asymmetry of the magnetic field geometry, observer location, and pitch angles of the electrons at the equator.