EPSC Abstracts
Vol. 15, EPSC2021-272, 2021
https://doi.org/10.5194/epsc2021-272
Europlanet Science Congress 2021

A new framework to explain changes in Io's footprint tail electron fluxes in the Juno era

Jamey Szalay[1], Frederic Allegrini[2,3], Fran Bagenal[4], Scott Bolton[2], Bertrand Bonfond[5], George Clark[6], Jack Connerney[7,8], Robert Ebert[2,3], Vincent Hue[2], David McComas[1], Joachim Saur[9], Ali Sulaiman[10], and Robert Wilson[4]

[1]Princeton University, Astrophysical Sciences, Princeton, United States of America (jszalay@princeton.edu)
[2]Southwest Research Institute, San Antonio, TX, USA
[3]Department of Physics and Astronomy, University of Texas at San Antonio, San Antonio, TX, USA
[4]Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO, USA
[5]Space Sciences, Technologies and Astrophysics Research Institute, LPAP, Université de Liège, Liège, Belgium
[6]Johns Hopkins University Applied Physics Lab, Laurel, MD, USA
[7]Space Research Corporation, Annapolis, MD, USA
[8]Goddard Space Flight Center, Greenbelt, Maryland, USA
[9]Institute of Geophysics and Meteorology, University of Cologne, Cologne, Germany
[10]Department of Physics and Astronomy, University of Iowa, IA, USA

Jupiter's aurora is complex and dynamic, with a large number of distinct auroral features and regions generated by multiple phenomena. Of these features, Io's auroral signature is one of the most persistent and identifiable aurora, with a rich observational history spanning decades of remote observations. Since Juno arrived at Jupiter, providing in-situ transits through flux tubes directly connected to Io's auroral emissions, its diverse set of instruments have revealed an even more complex and dynamic picture of Io's auroral interaction. In this presentation, we report on Juno observations of precipitating electron fluxes connected to 18 crossings of Io's footprint tail aurora, over altitudes of 0.15 to 1.1 Jovian radii (R_J). We will highlight how the strength of precipitating electron fluxes is dominantly organized by "Io-Alfvén tail distance", the angle along Io's orbit between Io and an Alfvén wave trajectory connected to the tail aurora. We will discuss how these fluxes were best fit with an exponential as a function of down-tail extent with an e-folding distance of 21°, the acceleration region altitude likely increases down-tail, and most of the parallel electron acceleration sustaining the tail aurora occurs above 1 R_J in altitude. Finally, we will highlight how Juno has likely transited Io's Main Alfvén Wing fluxtube, observing a characteristically distinct signature with precipitating electron fluxes ~600 mW/m^2 and an acceleration region extending as low as 0.4 R_J in altitude.