The Cusp as a VLF Saucer Source: First Rocket Observations of Long-Duration VLF Saucers on the Dayside

Chrystal Moser[1], James LaBelle[1], Spencer Mark Hatch[2], Jøran I. Moen[3], Andres Spicher[4], Toru Takahashi[5], Craig A. Kletzing[6], Scott Randolph Bounds[6], Kjellmar Oksavik[7], Fred Sigernes[8], and Tim Yeoman[9]

[1]Dartmouth College
[2]Birkeland Centre for Space Science
[3]Arctic Geophysics, University Centre in Svalbard, N-9171 Longyearbyen, Norway
[4]University of Oslo
[5]National Institute of Polar Research
[6]University of Iowa
[7]University of Bergen
[8]University Centre on Svalbard
[9]University of Leicester, UK

November 21, 2022

Abstract

Auroral whistler mode radio emissions called saucers are of fundamental interest because they require an unusually stationary emission process in the dynamic auroral environment, and it is a mystery how that can happen in this or similar conditions elsewhere in geospace. The Cusp Alfven and Plasma Electrodynamics Rocket (CAPER-2), launched into the polar cusp and obtained the first rocket measurements of a large-scale, multiple-armed dayside saucers, similar to those recently observed by the the DEMETER satellite, with the addition of in situ particle measurements and simultaneous conjugate ground-based measurements. For 300 s prior to cusp entry, CAPER-2 detected ˜15 truncated saucer arms lasting 5–50 s. Directional analysis using waveforms, combined with ground-based data, suggests that these originate within the cusp. Ray-tracing analysis indicates source altitudes ˜2500 km. On-board particle instruments show dispersed electron bursts in the cusp, presumed Alfvenically accelerated, corresponding to approximately the same source heights as the saucers.

Supporting Information for "The Cusp as a VLF Saucer Source: First Rocket Observations of Long-Duration VLF Saucers on the Dayside"

C. Moser[1], J. LaBelle [1], S. Hatch[2], J.I. Moen[3,4], A. Spicher[3], T. Takahashi[3],

C.A. Kletzing[5], S. Bounds[5], K. Oksavik[2,4], F. Sigernes[4], T.K. Yeoman[6]

to be submitted to Geophysical Research Letters

[1]Department of Physics and Astronomy, Dartmouth College, Hanover

[2]Birkeland Centre for Space Science, Department of Physics and Technology, University of Bergen, Norway

[3]Department of Physics, University of Oslo, Oslo, Norway

[4]Department of Arctic Geophysics, University Centre in Svalbard, Longyearbyen, Norway

[5]Department of Physics and Astronomy, University of Iowa, Iowa City

[6]University of Leicester School of Physics and Astronomy, Leicester

Contents of this file

Introduction A table with time of closet approach, t_0, separation distances, x_0 and source heights, h, to saucer sources labeled in Figure 2b of paper for both the straight line approximation and using ray tracing.

Table S1. Best-fit t_0, x_0 and h values for each event labeled in Figure 2b using the straight line approximation for the source location, and for the ray tracing approximation of the source location, which assumes $x_0 = 0$.

Event	t_0 [sec]	x_0 [km]	h [km] straight	h [km] trace
1	234	120	1210	2500
2	293	170	1740	2600
3	286	90	1210	2300
4	377	100	1390	1500
5	313	140	1980	2800
6	406	150	2560	2500
7	356	210	3140	4700
8	429	10	2340	1900
9	515	40	3980	3100
10	461	0	2900	2100
11	459	10	2700	2000
12	449	20	2290	1700