

SPRITE IMAGES AND SPECTRA WITH HIGH TIME RESOLUTION

H. C. Stenbaek-Nielsen<sup>1</sup>, M. G. McHarg<sup>2</sup>, T. Kammae<sup>1</sup>

<sup>1</sup>University of Alaska, Fairbanks, AK 99775, USA

<sup>2</sup>US Air Force Academy, Colorado Springs, CO 80840, USA

A sprite campaign fielding a large aperture imaging spectrograph and a high speed imager was conducted from the Langmuir Laboratory, Socorro, New Mexico, in June and July 2005. The spectrograph slit was orientated vertically to provide height resolved spectra. The spectra were recorded on a digital intensified CCD capable of 1000 frames per second, i.e. millisecond time resolution, but the best spectra were recorded using a frame rate of 300 per second. The images cover a wavelength range of about 170 nm within the spectrographs range from 450 nm to 900 nm. Most of the data were obtained in the range from 640 to 810 nm. The estimated spectral resolution is 2 nm. The observed spectra are dominated by molecular nitrogen emissions. It is uncertain if any nitrogen ion lines are present. The high speed images were made at 10,000 frames per second gated at 50 micro seconds per frame. At this frame rate we are resolving streamer development only hinted at in our earlier millisecond resolution images. The observations show a bead, presumably the streamer head, propagating downward at approximately  $7 \times 10^6$  m/s for 1,500 microseconds. The emissions from the bead are followed 800 microseconds later by emissions from the entire sprite column. We see evidence for branching of the streamer tips in several cases. Beads propagating upward are also observed with the streamers transitioning into more diffuse emissions. Previous work (Pasko and Stenbaek-Nielsen, GRL, 29(10), 2002) indicates this transition region is related to the local dielectric relaxation time. Examples of elves and halos exhibit a much more complex temporal development than envisioned based on the earlier millisecond observations.

Abstract Submission Form

2006 National Radio Science Meeting

Abstract: stenbaek-nielsen30918

Date Received: September 19, 2005

1. (a) Hans Stenbaek-Nielsen  
Geophysical Institute  
University of Alaska  
Fairbanks, AK  
99775 USA  
hnielsen@gi.alaska.edu  
(b) 907-474-7414  
(c) 907-474-7291
2. H - Waves in Plasma
3. (a) S-H/G2
4. I - Invited Paper, Program chair:  
Gerken/Pasko
5. No special instructions