**Sprite Spectral and Spatial Observations at 100 μs resolution**

Matthew G. McHarg[(1)], Hans Stenbaek-Nielsen [(2)], and Takeshi Kanmae[(2)]
(1) The United States Air Force Academy, USAF Academy, CO, 80840
(2) Geophysical Institute, University of Alaska, Fairbanks, AK.

Two ground based observational campaigns of sprites were successfully conducted at the Langmuir Laboratory, located west of Socorro, New Mexico during the summers of 2005 and 2007. An additional unsuccessful campaign was conducted during the summer of 2006 at the Wyoming Infrared Observatory, southwest of Laramie Wyoming. During the campaigns the principle observations were made with a Phantom 7 high speed camera, with a Video Scope International VS4-1845 HS image intensifier. The high frame rate of the camera, combined with the short persistence phosphor of the image intensifier allowed investigation of details of sprite streamers heads.

The observations show that sprites start with streamer heads moving straight down, which rapidly brighten and in many cases subsequently divide or split as they move downward. These downward streamer heads are sometimes followed by upward moving streamer heads which tend to propagate "outward" with a significant horizontal component of velocity. The location of these streamer heads over time dictate the morphology of the sprite when observed with slower time resolution observations. Column sprites have only downward propagating streamer heads, while carrot sprites have both downward and upward steamer heads present.

New during the summer 2007 campaign are spectral measurements made of sprites at 100 μs resolution using a slit less spectrometer based around the Phantom 7. We will discuss the evolution of the streamer head spectra as a function of time and altitude. Additionally in the 2007 campaign, we have recorded sprites using a 300 mm lens, with a 2.12x1.58 degree field of view. These close-up views of sprites reveal multiple splitting of the streamer heads during propagation. These new sprite images reveal a fascinating new facet of sprites, namely the time evolution of streamer head propagation and division in a background electric field.