# MOLECULAR NITROGEN LBH BAND SYSTEM FAR-UV EMISSIONS OF SPRITE STREAMERS

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Optical and near-UV emissions have been detected in transient luminous events (TLEs) above thunderstorms during observations from the ground and aircraft [e.g., Sentman et al., GRL, 22, 1205, 1995; Mende et al., GRL, 22, 2633, 1995; Hampton et al., GRL, 23, 89, 1996; Armstrong et al., JASTP, 70, 787, 1998; Suszcynsky et al., JASTP, 70, 801, 1998; Armstrong et al., GRL, 27, 653, 2000; Morrill et al., GRL, 29, 1462, 2002]. The recent successful launch of the ISUAL instrument [Chern et al., JASTP, 65, 647, 2003] on ROCSAT-2 satellite provides new opportunities for studies of far-UV (FUV) emissions of TLEs, which are not observable by the ground and aircraft based instruments due to the strong absorption by atmospheric molecular oxygen. The ISUAL instrument includes a spectrophotometer with bandpass 150-280 nm, which is well overlapping with the emissions spectrum 100-260 nm of N2 Lyman-Birge-Hopfield (LBH) band system [e.g., Chern et al., JASTP, 65, 647, 2003, and references therein]. The first successful observations of FUV emissions by the ISUAL have been recently reported [Mende et al., NATO ASI on Sprites, Corte in Corsica, July 24-31, 2004; Frey et al., Eos. Trans. AGU, 85, Fall Meet Suppl., 2004], and theoretical understanding of FUV emissions arising from different types of TLEs, and from sprite streamers in particular, represent an important component of related studies needed for interpretation of the experimental data. In this talk, we report results on application of time dependent optical emission model developed in [Liu and Pasko, JGR, 109, A04301, 2004] to studies of sprite streamers under different applied electric fields representative of conditions at sprite altitudes with particular emphasis on FUV emissions from the N2 LBH band system. Our modeling results indicate, in particular, that for streamers propagating in low electric fields characteristic of lower parts of sprites (i.e., below the initiation altitude) the LBH emissions originate mostly from the streamer tips with the integral intensity a factor of 20 lower than that of red emissions of the first positive band system of N2, while a factor of 2 stronger than the blue and near-UV emissions of the first negative of N2+. The results for streamers propagating in low electric fields also demonstrate that the streamer channel is dark, and most of the optical luminosity of streamers in this case arises from tips of streamers, in agreement with recent time resolved ($\sim$1 ns) imaging of laboratory streamers in point-to-wire or point-to-plane discharge geometry conducted at ground and near ground pressures [van Veldhuizen et al., IEEE Trans. Plasma Sci., 30, 162, 2002; Yi and Williams, J. Phys. D. Appl. Phys., 35, 205, 2002].

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2. H - Waves in Plasma

3. (a) G/H Lightning and Sprites

4. C - Contributed Paper

5. No special instructions