Papers to read/cite for Str2LeadTrans Paper

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In **[Luque and Ebert, 2010]**,

(a) They write, "As discussed in the previous section, the densities of charged particles increase like N so an exponentially increasing number of electrons is liberated around the head. These electrons drift upwards, where the ion density is basically frozen (neglecting small variations due to attachment). **Hence at some point the electron density surpasses the ion density and creates a net negative charge that is responsible for the increase in the electric field, eventually to values above Ek; then a second ionization wave sets in.**" The question, I pose is, does a second-ionization wave occur if heating is neglected?

(b) They also write, "Other observations in high-speed sprite imaging also suggest a negative charging of the streamer channel. The first is the emergence of negative (upward-propagating) streamers, always reported to occur from a previous channel and some milliseconds after the passage of a positive streamer head. In some observations [Stanley et al., 1999; Cummer et al., 2006; Stenbaek-Nielsen and McHarg, 2008] the emergence of negative streamers coincides with the lower edge of the trailing emissions. "

From **Liu and Pasko [2004]**:

(a) "These processes, however, are known to be important for the dynamics of long streamers developing in point-to-plane discharge gaps in low electric fields ($<E_k$) Morrow and Lowke [1997]."

From **Shi et al. [2016]**:

(a) "On the other hand, the exponential growth of a streamer may be a property particularly important for lightning initiation, since the current flowing in the channel also exponentially increase Liu [2010], potentially accelerating the heating processes in the discharge channel. It is thus necessary to investigate whether the streamer initiated from a hydrometeteor will exponentially grow over a long distance as it was assumed in Liu et al. [2012] and Sadighi [2015] and to obtain its propagation characteristics."

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