

Abstract Submitted  
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**Understanding halo and sprite discharges above thunderclouds**

UTE EBERT, CWI Amsterdam, ALEJANDRO LUQUE, IAA-CSIC, Spain — Halos, sprites and other transient luminous discharges can emerge high above thunderclouds. They are generated by the electromagnetic fields of lightning strokes where air density decreases with altitude, while free electron density increases. We present simulations of diffuse halo and subsequent structured sprite discharge, taking all these features into account from the 90 km earth-ionosphere distance down to the inner scales of sprite streamers on the scale of meters. The simulations quantitatively match the observations and can actually be developed into a probe for electron density at hardly accessible altitudes in the atmosphere.

[1] *Emergence of sprite streamers from screening-ionization waves in the lower ionosphere*, A. Luque, U. Ebert, Nature Geoscience **2**, 757-760 (2009).

[2] *Sprites in varying air density: charge conservation, glowing negative trails and changing velocity*, A. Luque, U. Ebert, Geophys. Res. Lett. **37**, L06806 (2010).

[3] *Review of recent results on streamer discharges and their relevance for sprites and lightning*, U. Ebert *et al.*, J. Geophys. Res., in press.

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