

Physics 535 – Lecture 13

Physics of Lightning

Space Charge, to Field, to Potential

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(Photo courtesy of Harald Edens)

Spherical Charge Distribution:

While charged disks are probably a better simple model of a storm cloud, early models assumed uniform spheres of charge.

Kasemir assumes this in his 1950 paper.

Let's consider a positive and negative uniformly charged sphere of equal radius and derive field and potential vs. altitude.

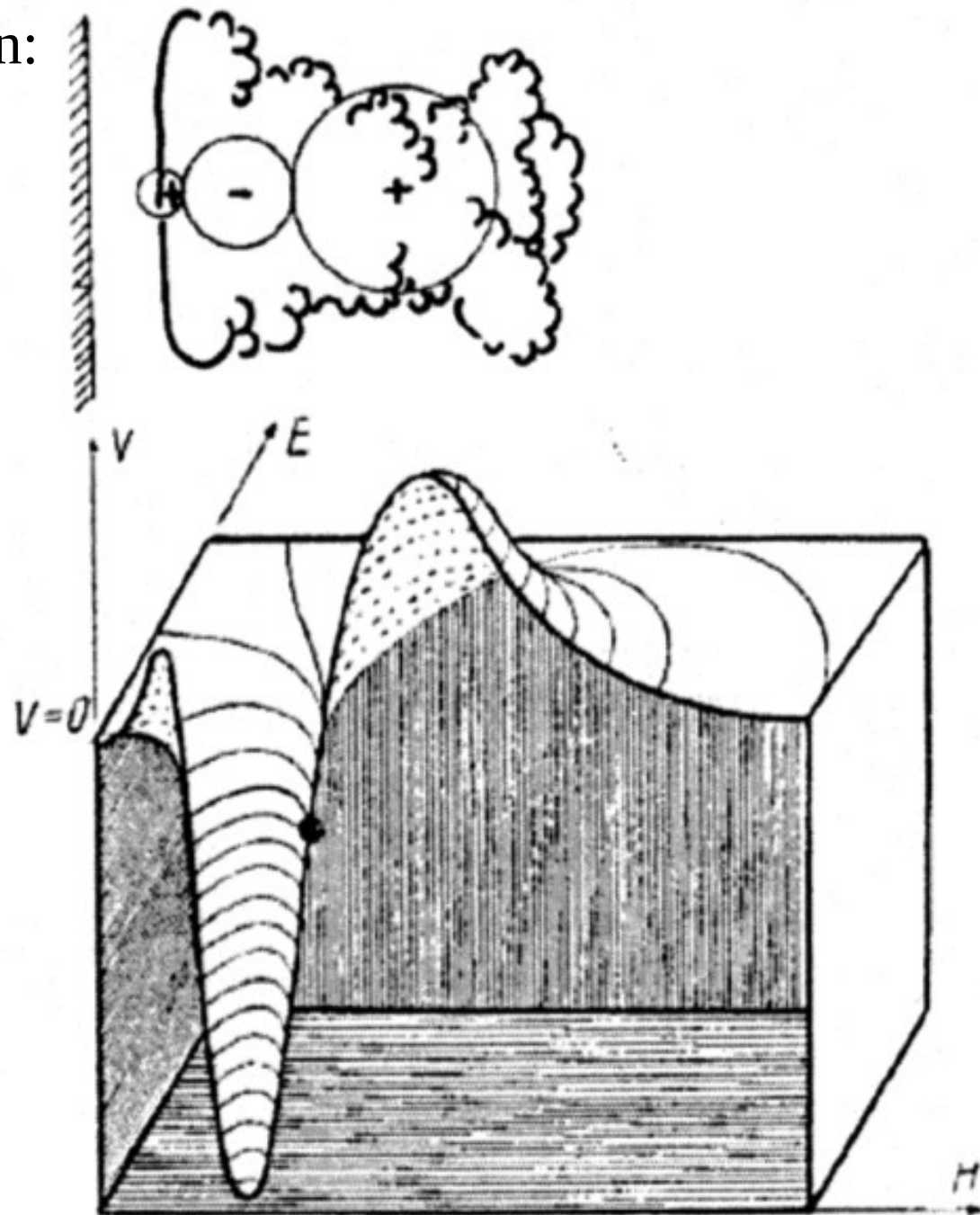


Figure 3. Potential relief of the Wilson-Simpson thunderstorm

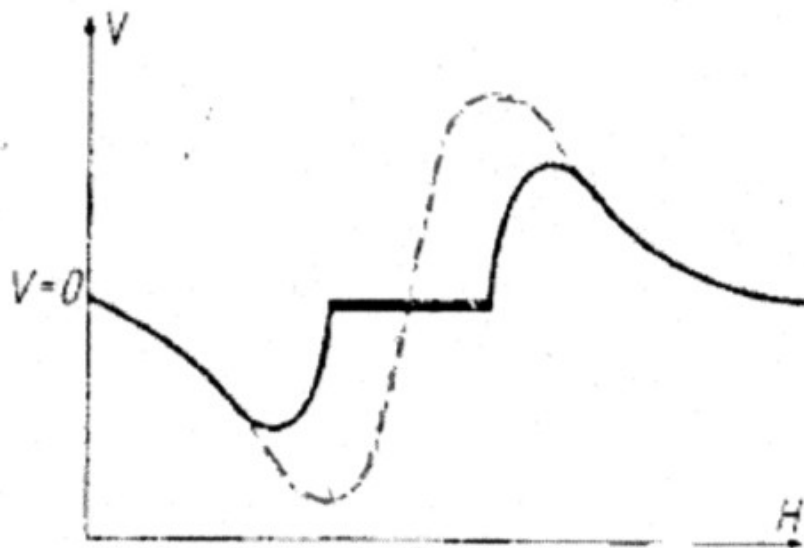


Figure 4. Initial stage of lightning in a bipolar space charge.

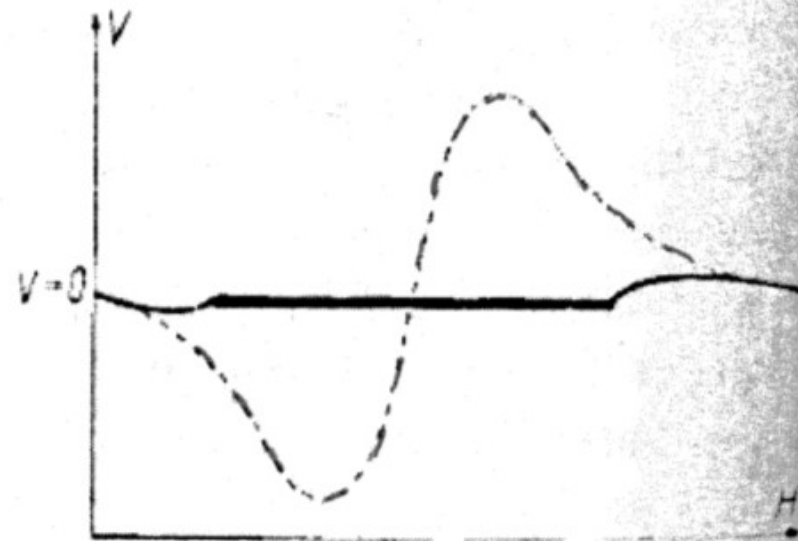


Figure 5. Final state of lightning in a bipolar space charge.

We discover that it looks exactly like Kasemir sketched.