The Hidden Danger of Killer Lightning
The Stepped Leader
Cloud to ground stroke

- Air is a very good insulator.
- To have lightning:
  - Need to have the charge centers very close to each other
  - Have very large differences in charge "strength"
- In order to get lightning in a thunderstorm you need to separate large amounts of charge.

How is this done?

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If the electric field, or the difference between the negative and positive charge regions, is large enough, the insulator between the charge regions (the air) "breaks down" and the lightning discharge can occur between the regions of positive and negative charge.
The stepped leader is vey faint, essentially invisible to the human eye. Produces an ionized channel during the lightning stroke.

Dart Leader: Often a second series of stepped flow of electrons moves from the cloud toward the ground. Since the ionized channel already exists, the stepped flow is much faster. ***This stepped flow is called the dart leader***.

Return Stroke: One of the streamers will meet the stepped leader not necessarily the one from the tallest object! When the dart leader connects with a streamer from the ground (usually along the same path) another return stroke moves toward the cloud and ground.

When the stepped leader gets near the ground (100 m or so):
Positive charge moves from the ground up toward the stepped leader -- these are called ***streamers.***The streamers may come from almost any pointed object on the ground:

People, Trees, Flagpoles, Antennas, Telephone Poles, Boats etc.

Created by Martin Babakhan