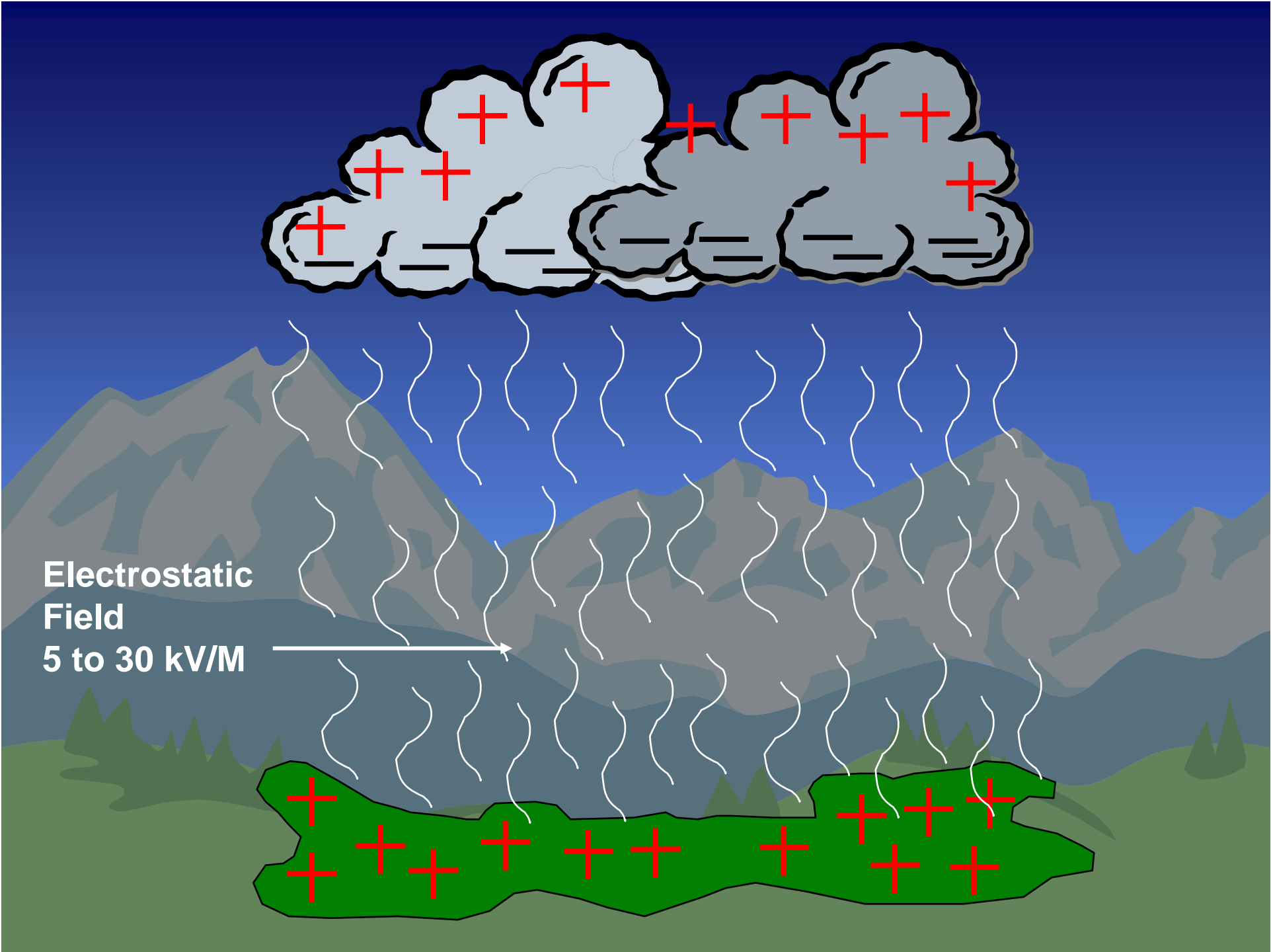
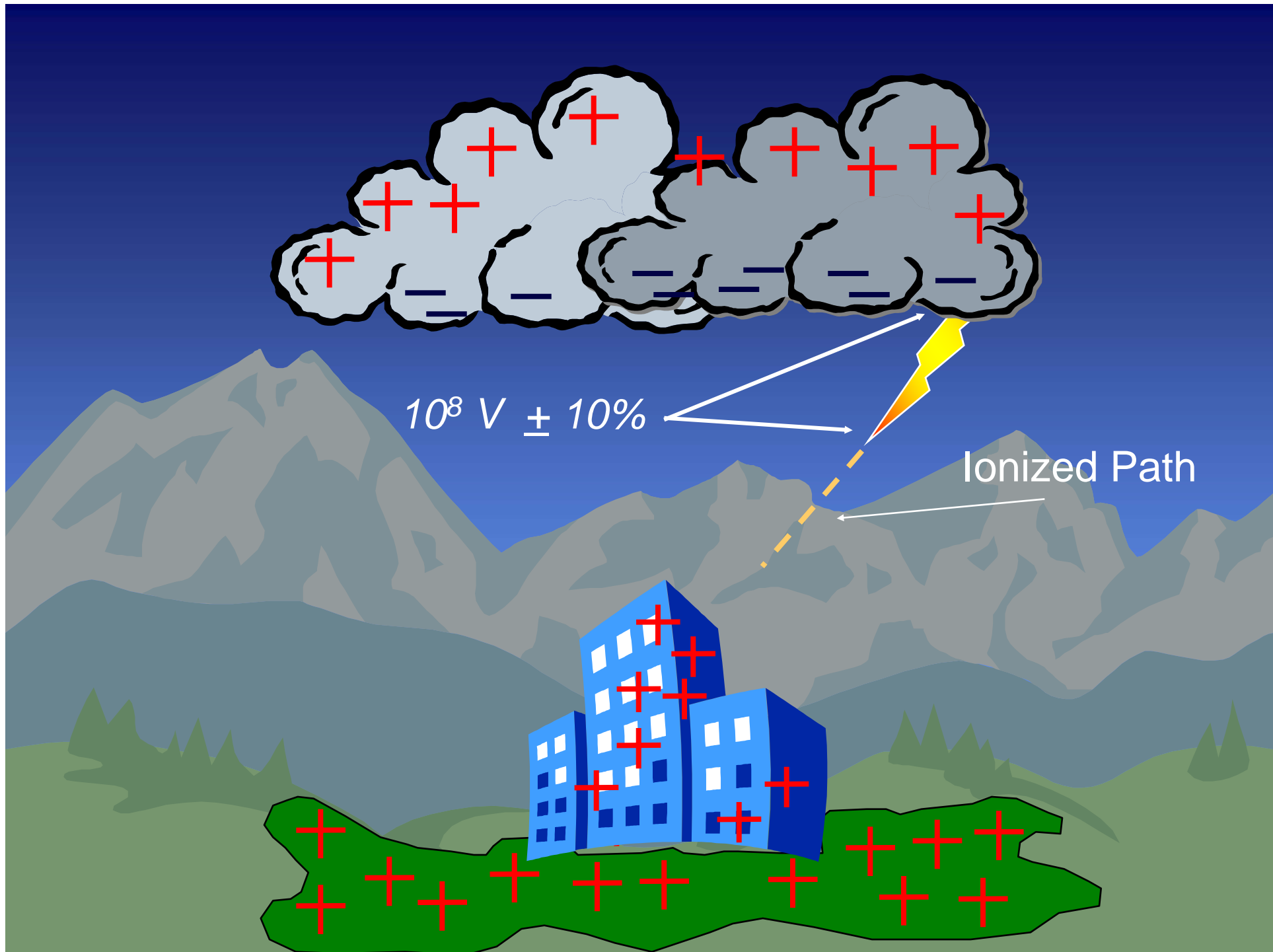


The Lightning Discharge



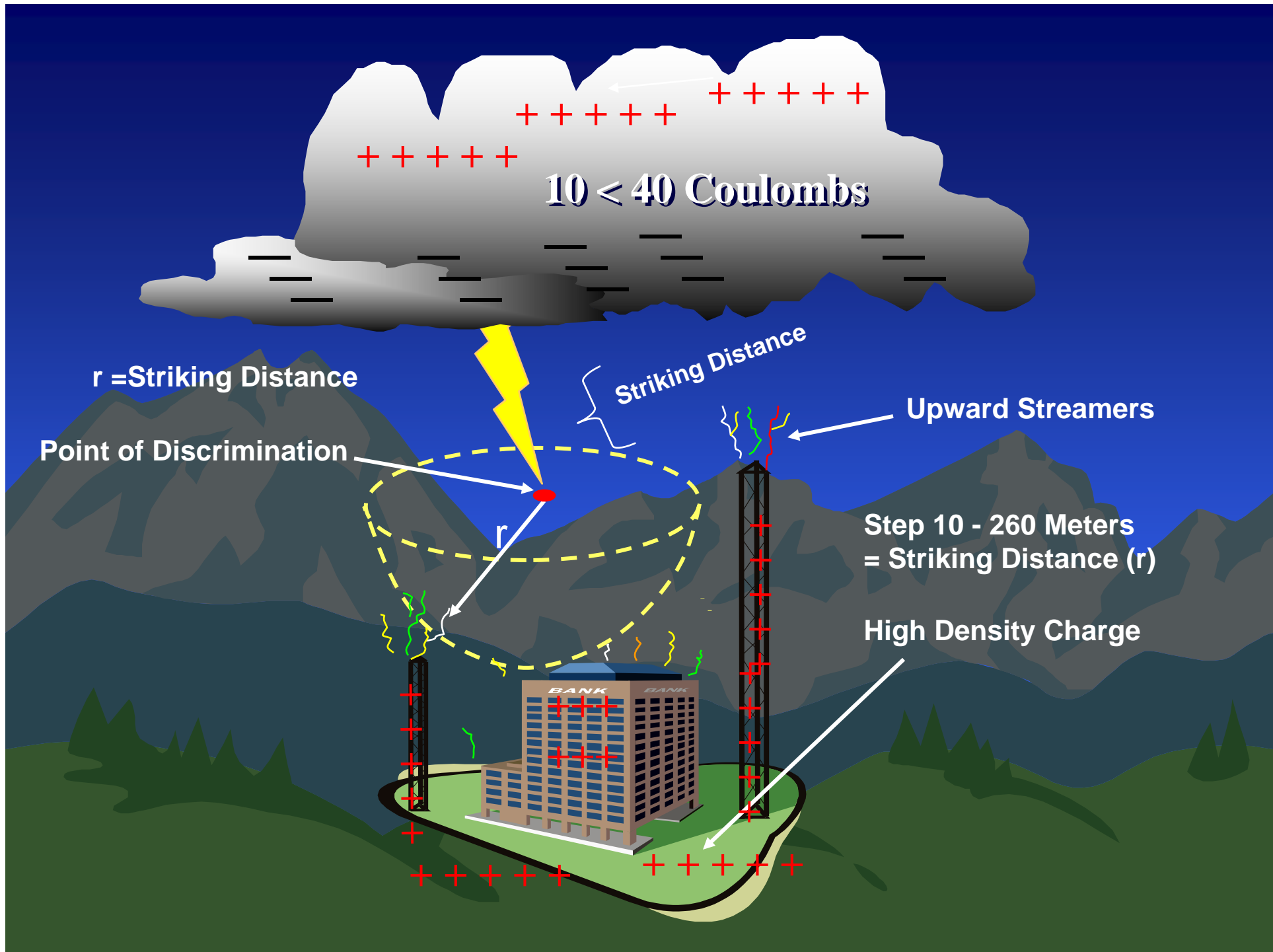


**Electrostatic
Field
5 to 30 kV/M**

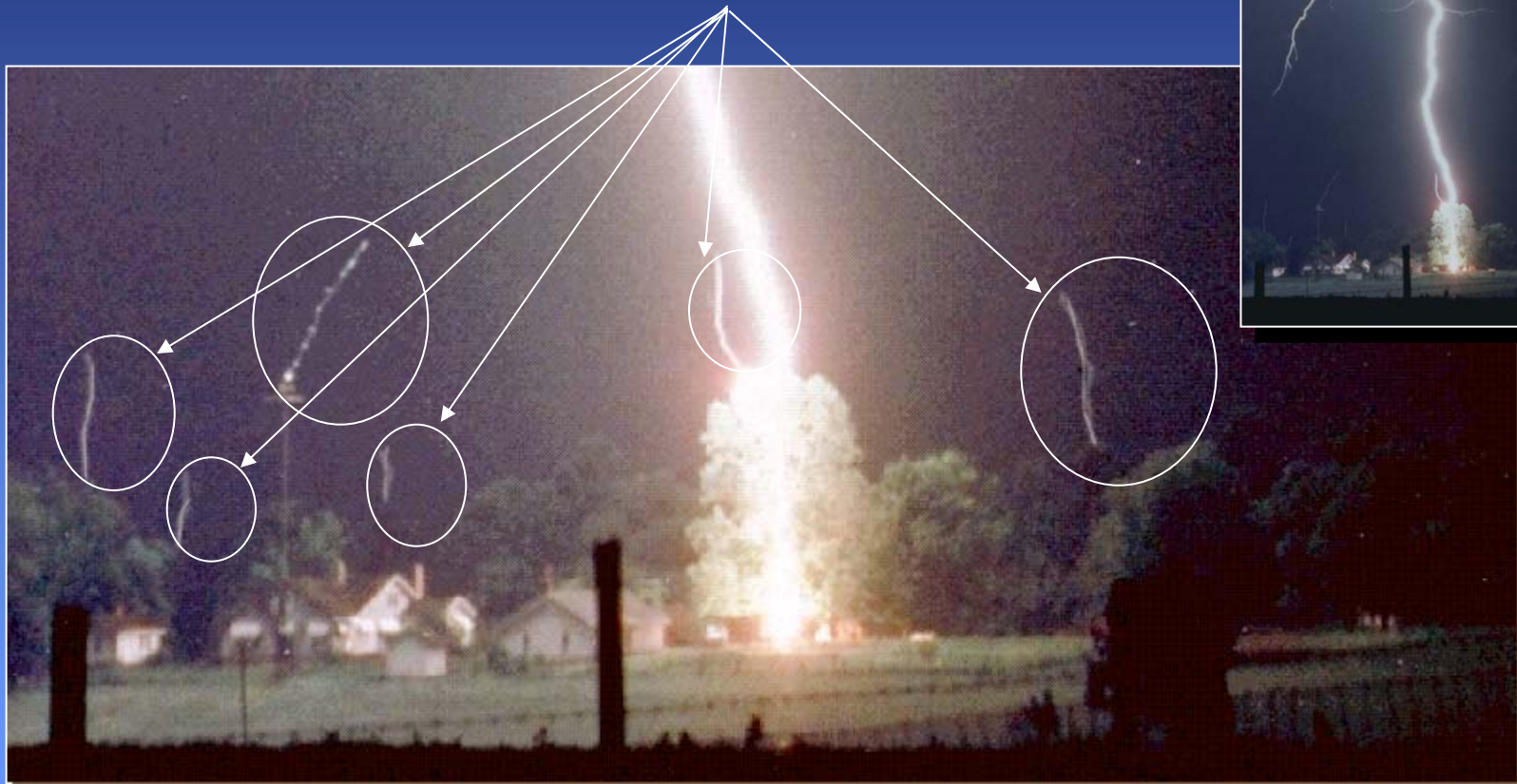


$10^8 \text{ V} \pm 10\%$

Ionized Path



Storm Generated Upward Streamers



Pre-Discharge

(Cell Data)

- **Size**
 - Range 10 to 103 km²
 - Average 15 km²
- **Charge**
 - Range 10 to 120 C
 - 99% 40 C
- **Voltage at peak** 10⁹ to 10¹⁰ Volts
- **Height Above Earth** 0.1 to 6 km



Leader Data (99%)

- Total Charge 1 to 20 C
- Average Charge 5 C
- Per Unit Length 10⁻³ C/M
- Propagation Speed 0.4 - 1.2 M/us
- Pulse Rise Time 100 ns
- Leader Potential 10⁷ – 10¹⁰ Volts
- Step Time 13 to 50 us
- Step Length 10 to 200 Meters



Return Stroke Data

Peak Current

99%

50%

Polarity Negative

Time Between flashes

No. Strokes per Flash

Time Between Stokes

Duration (99%)

RFI Range (95%)

2 to 510 kA

≤ 200 kA

$\cong 30$ kA

$> 90\%$

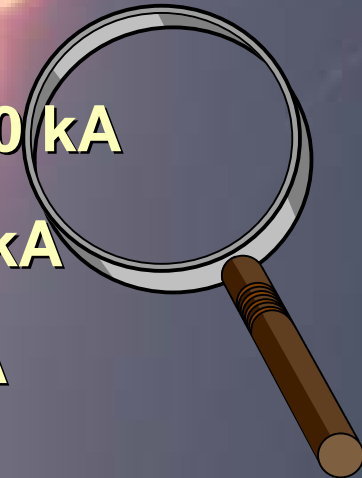
> 10 Seconds

1-27

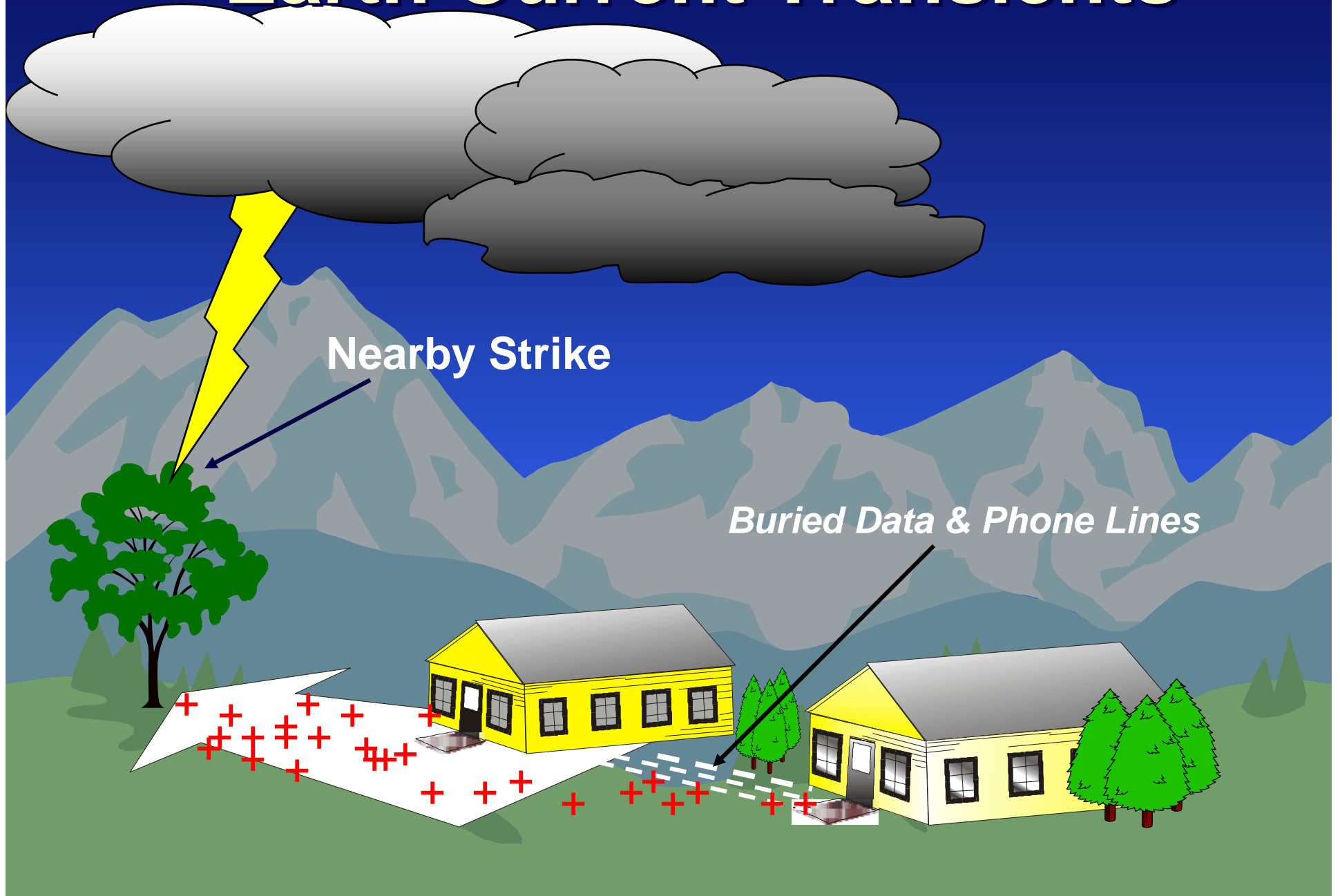
10 – 30 ms

30 to 200 μ s

200 kHz - 20 mHz



Earth Current Transients



Atmospheric Transients

Varying
Electrostatic
Field

Nearby
Strike

*Inter-Plant
Data Lines

*Suspended Power Lines

*Will Experience Induced Transients

