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RTb-211

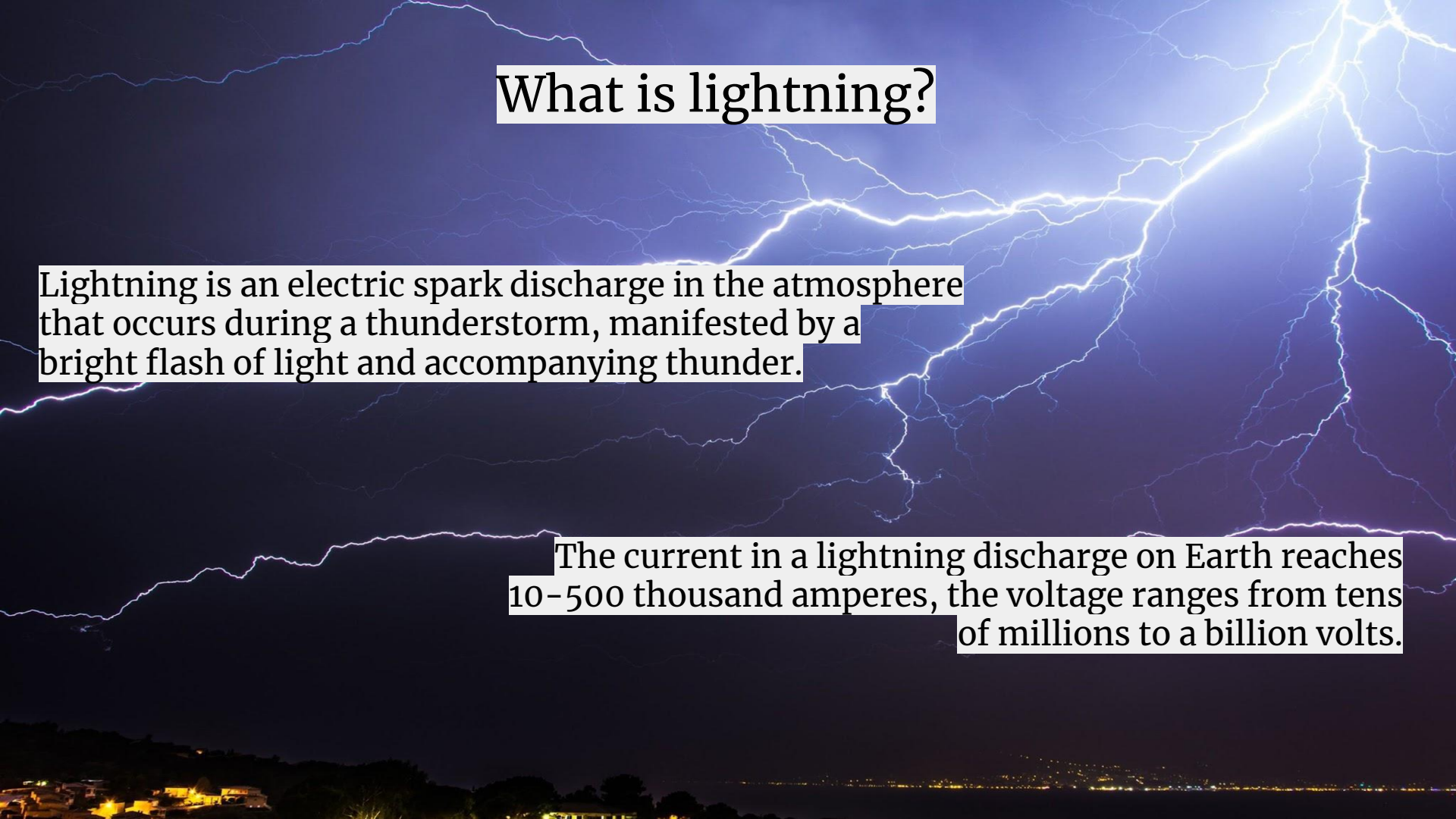
Lightnings and their types.

What is lighting?

Cloud-to-ground lightnings.

Cloud-to-Cloud and Intra-Cloud lightnings.

Lightnings in the upper atmosphere.



What is lightning?

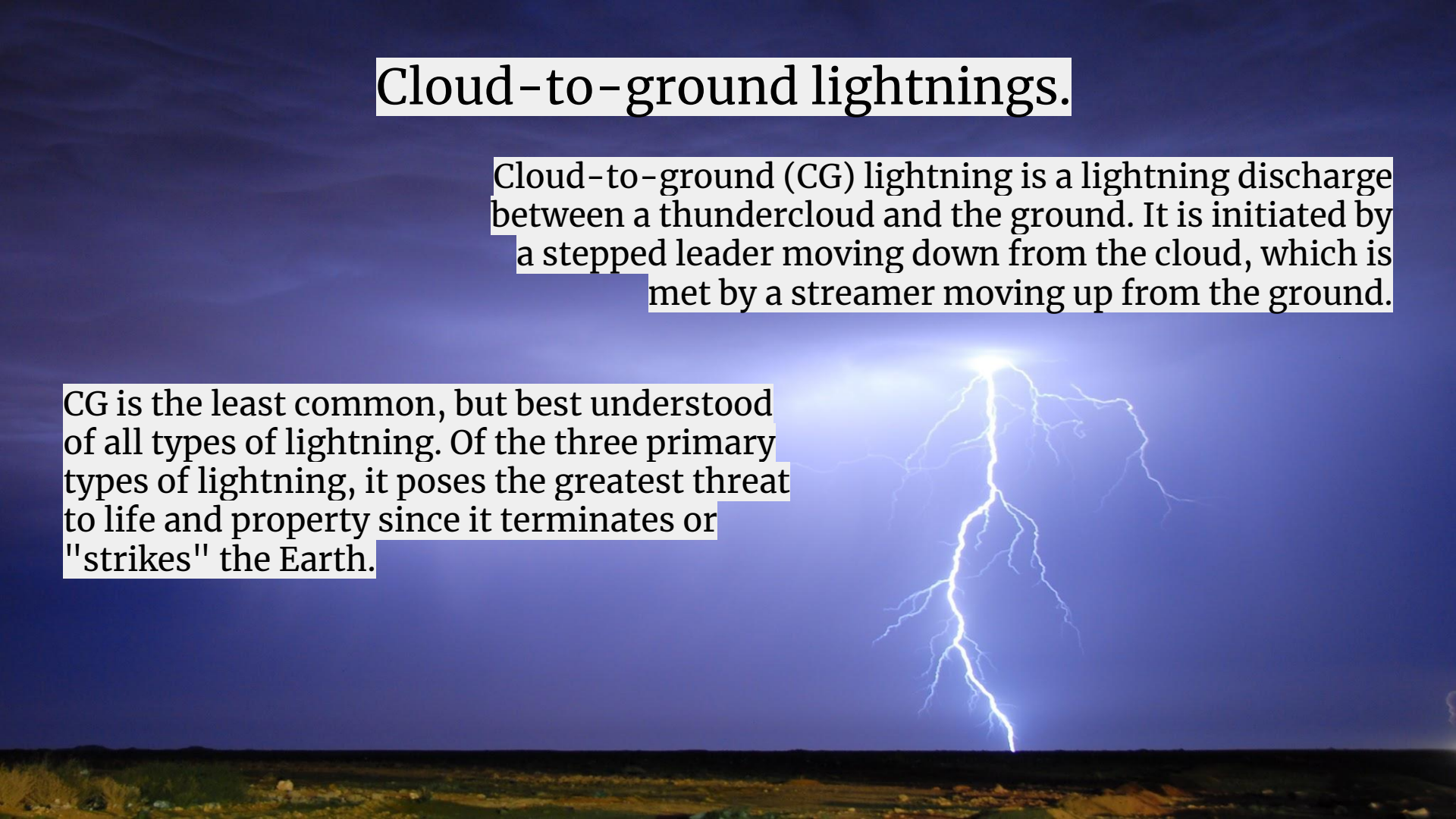
Lightning is an electric spark discharge in the atmosphere that occurs during a thunderstorm, manifested by a bright flash of light and accompanying thunder.

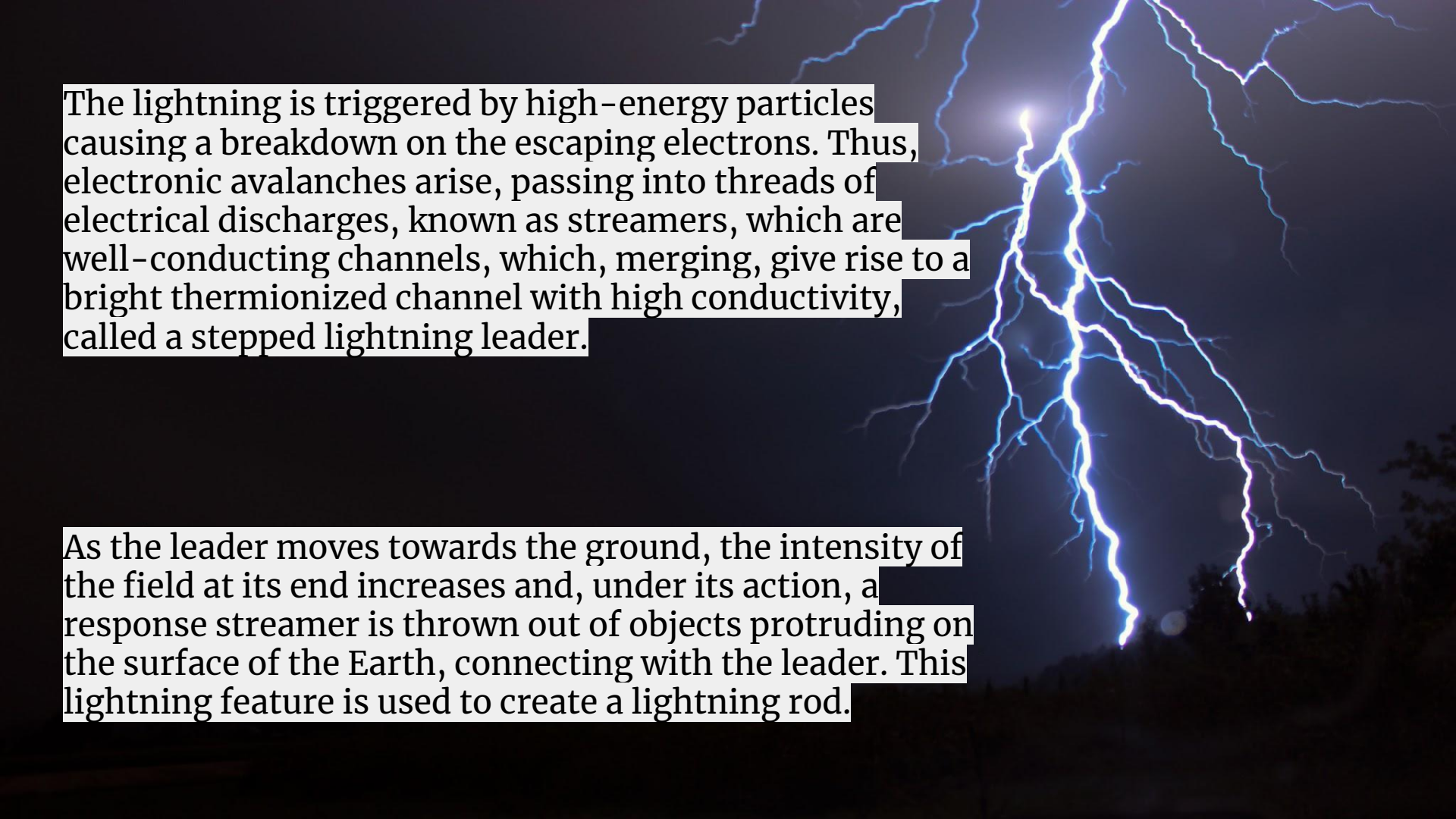
The current in a lightning discharge on Earth reaches 10-500 thousand amperes, the voltage ranges from tens of millions to a billion volts.

Cloud-to-ground lightnings.

Cloud-to-ground (CG) lightning is a lightning discharge between a thundercloud and the ground. It is initiated by a stepped leader moving down from the cloud, which is met by a streamer moving up from the ground.

CG is the least common, but best understood of all types of lightning. Of the three primary types of lightning, it poses the greatest threat to life and property since it terminates or "strikes" the Earth.

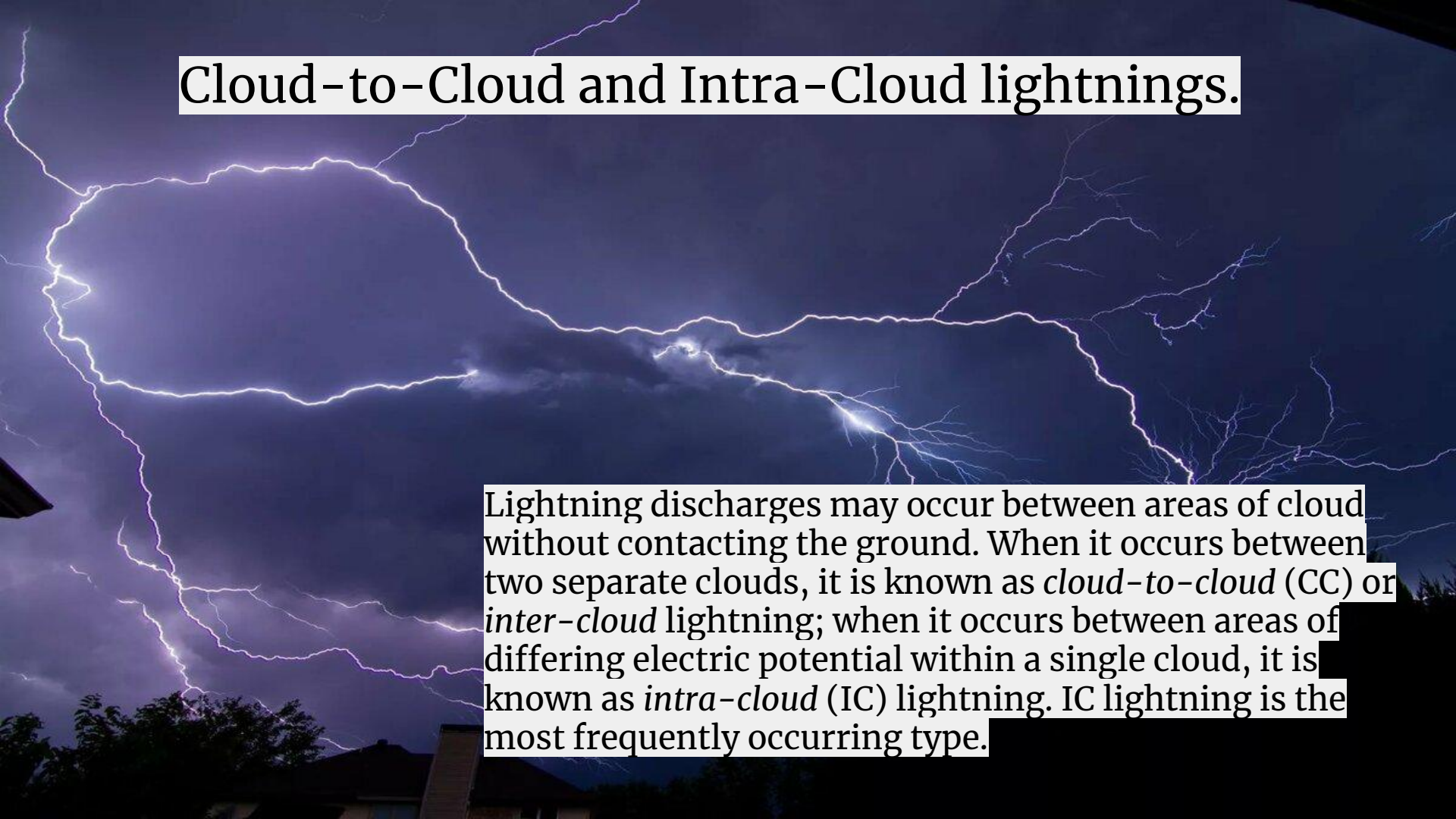




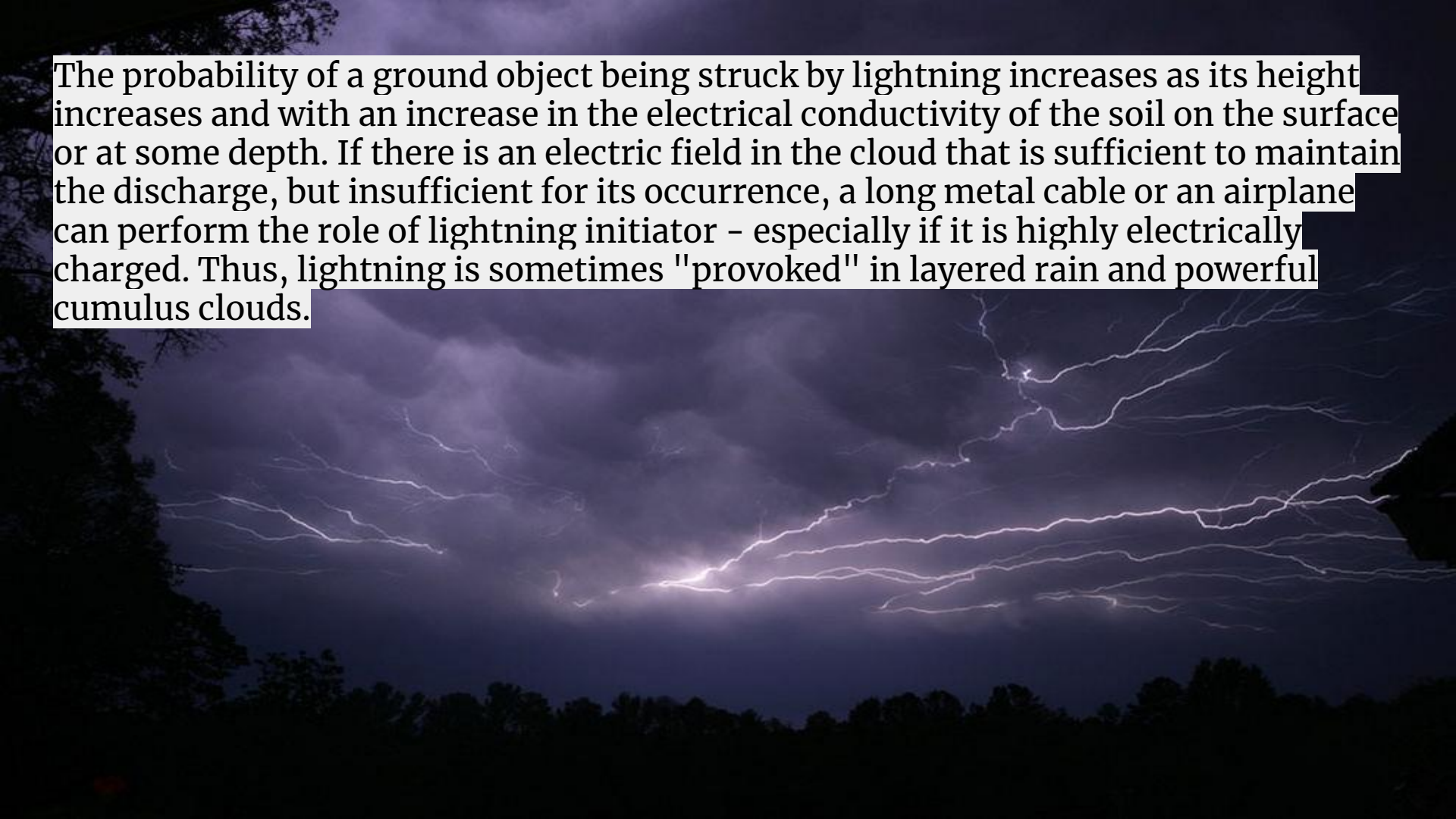
The lightning is triggered by high-energy particles causing a breakdown on the escaping electrons. Thus, electronic avalanches arise, passing into threads of electrical discharges, known as streamers, which are well-conducting channels, which, merging, give rise to a bright thermionized channel with high conductivity, called a stepped lightning leader.

As the leader moves towards the ground, the intensity of the field at its end increases and, under its action, a response streamer is thrown out of objects protruding on the surface of the Earth, connecting with the leader. This lightning feature is used to create a lightning rod.

Cloud-to-Cloud and Intra-Cloud lightnings.

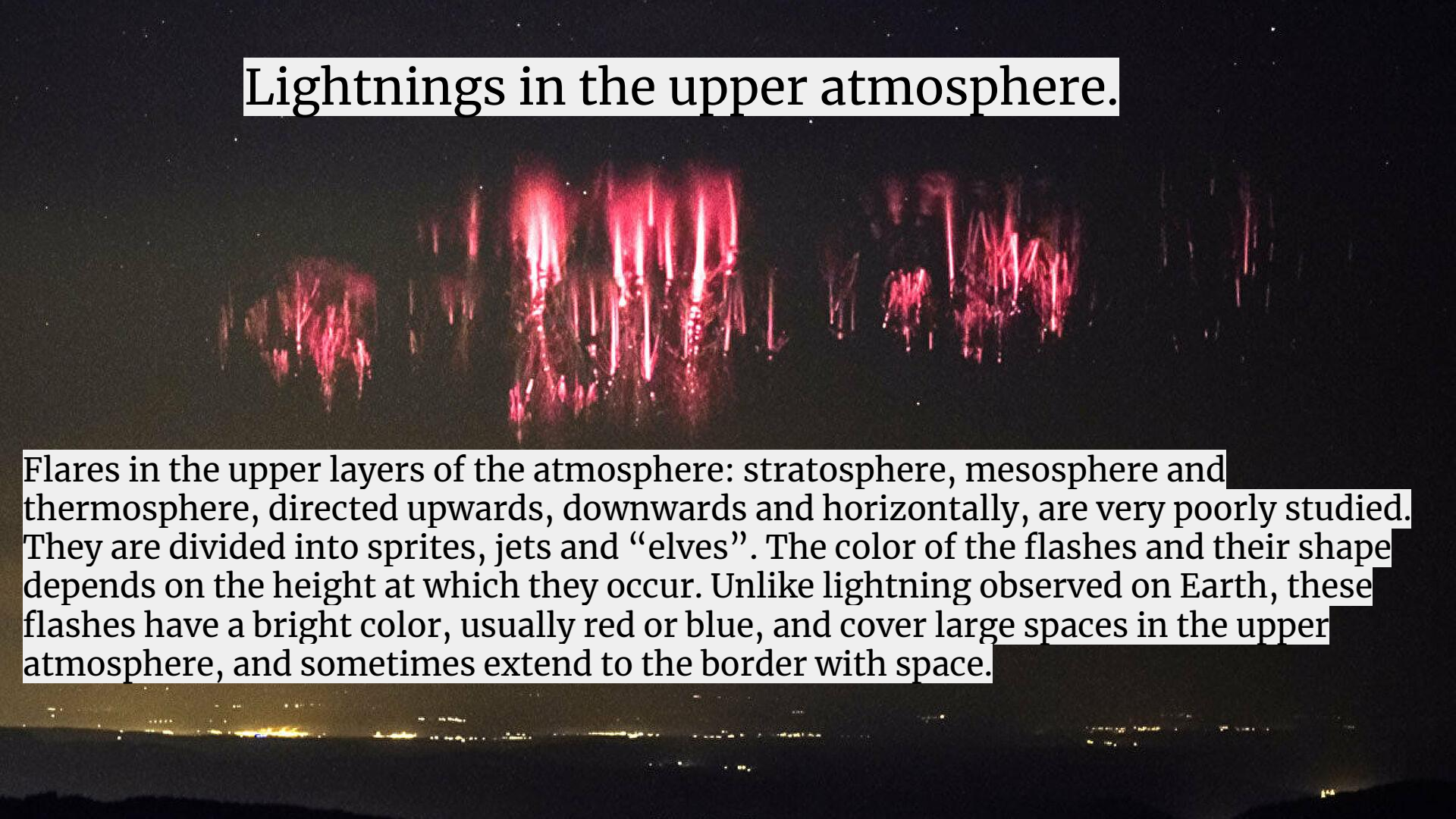


Lightning discharges may occur between areas of cloud without contacting the ground. When it occurs between two separate clouds, it is known as *cloud-to-cloud* (CC) or *inter-cloud* lightning; when it occurs between areas of differing electric potential within a single cloud, it is known as *intra-cloud* (IC) lightning. IC lightning is the most frequently occurring type.



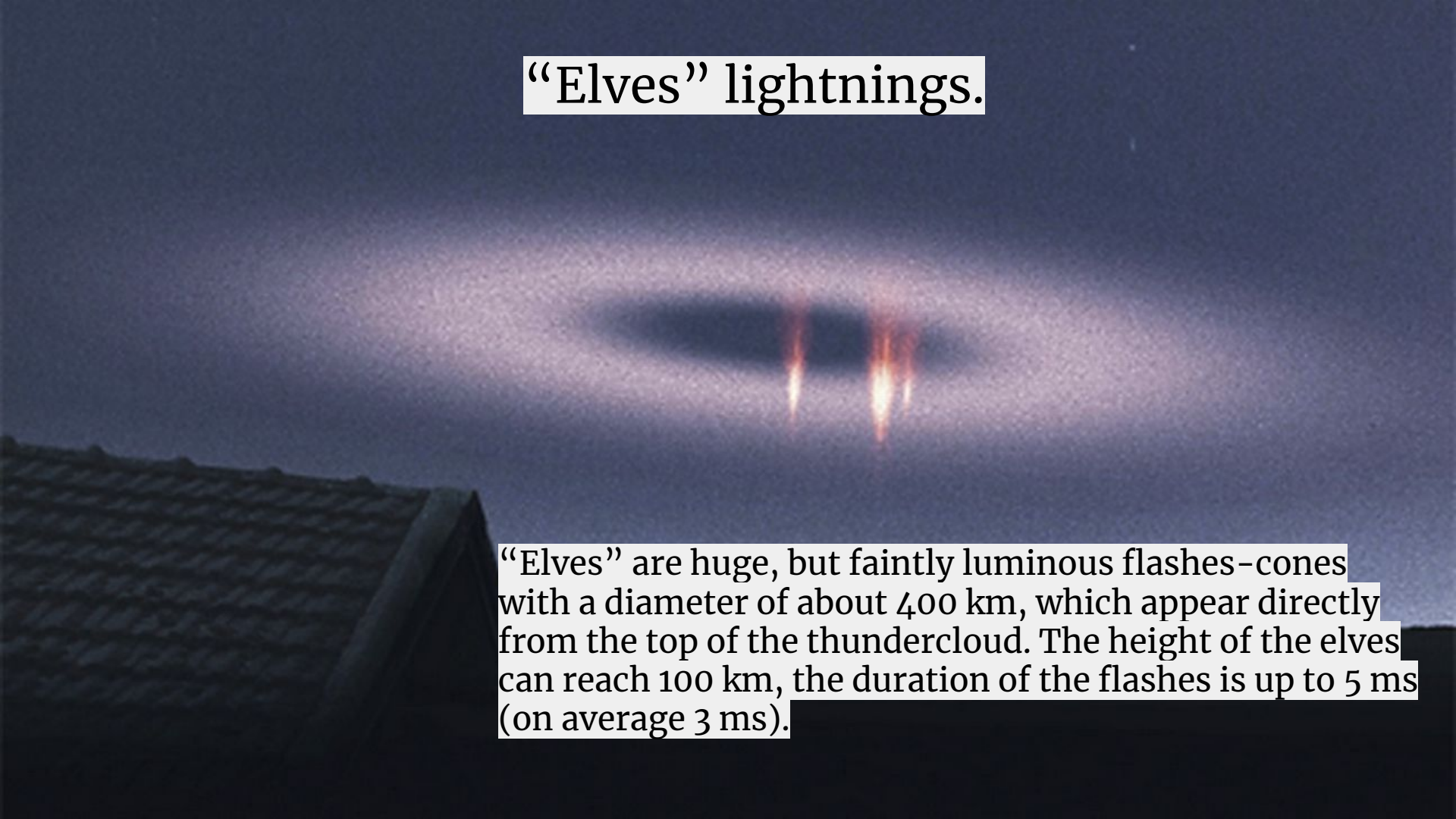
The probability of a ground object being struck by lightning increases as its height increases and with an increase in the electrical conductivity of the soil on the surface or at some depth. If there is an electric field in the cloud that is sufficient to maintain the discharge, but insufficient for its occurrence, a long metal cable or an airplane can perform the role of lightning initiator - especially if it is highly electrically charged. Thus, lightning is sometimes "provoked" in layered rain and powerful cumulus clouds.

Lightnings in the upper atmosphere.



Flares in the upper layers of the atmosphere: stratosphere, mesosphere and thermosphere, directed upwards, downwards and horizontally, are very poorly studied. They are divided into sprites, jets and “elves”. The color of the flashes and their shape depends on the height at which they occur. Unlike lightning observed on Earth, these flashes have a bright color, usually red or blue, and cover large spaces in the upper atmosphere, and sometimes extend to the border with space.

“Elves” lightnings.



“Elves” are huge, but faintly luminous flashes-cones with a diameter of about 400 km, which appear directly from the top of the thundercloud. The height of the elves can reach 100 km, the duration of the flashes is up to 5 ms (on average 3 ms).

Jets.

The jets are blue cone tubes. The height of the jets can reach 40-70 km (the lower boundary of the ionosphere), the duration of the jets is longer than that of the elves.

Sprites.

Sprites are difficult to distinguish, but they appear in almost any thunderstorm at an altitude of 55 to 130 kilometers. This is a kind of lightning striking up from the cloud. For the first time this phenomenon was recorded in 1989 by accident. Now very little is known about the physical nature of sprites.