High-Frequency Emission from Sprites

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Sprites are complex transient plasma discharges that often consist of a great number of plasma filaments named streamers. They are produced high above thunderstorms through quasi-electrostatic coupling with the ionosphere. Sprites are known to produce electromagnetic radiation observed typically from a few hertz to a few tens of kilohertz [1-3]. From the observation of sprites using high-speed imaging at 100,000 fps, a new view of sprites' dynamics and complexity has emerged [4]. Numerous collisions of streamers seem to occur in complex sprites [4]. Sprite streamer collisions are suspected to produce electromagnetic emission in the high-frequency (HF) range (3-30 MHz) [5]. Indeed, head-on streamer collisions lead to a reinforcement of the electric field over a short time scale, typically a few picoseconds at ground-level [6]. The use of the similarity laws leads to a corresponding time scale on the order of a fraction of a microsecond at 50 km altitude, hence in the HF domain [5].

In this invited contribution, we investigate the characteristics of possible HF emission from sprites, the information they might carry, as well as their observation from the ground using the radiotelescope NenuFAR [7,8].

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