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Sprites over South Africa

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Sprites observations were recorded in South Africa for the first time on the 11th of January 2016 from Sutherland using a night-vision TV camera from SANSA's Optical Space Research laboratory. Sprites are middle atmosphere optical emissions produced by large positive cloud-to-ground lightning discharges which have an average peak value of ~ 74 kA. Sprites appear in different forms, such as carrot, jellyfish, column or disk-shaped, typically in the height range ~ 40 -90 km above the thunderstorm. Sprites also contribute to the global electric circuit. Lightning strikes and sprites produce unique Very Low Frequency (VLF) and Extremely Low Frequency (ELF) radio wave signatures that can be detected remotely on the ground by using ELF receiver. South Africa has large convective thunderstorms typically in January and February of every year. Lightning strength, time and position data is obtained from the SA Weather Service and may also be tracked in real time using the World Wide Lightning Locating Network (WWLLN). The aim of this research is to determine the maximum altitude of sprites, and the altitude of maximum brightness, as a function of the lightning magnitude. The cameras' spatial pointing geometry was calibrated using stars. The algorithm for distance and height triangulation in spherical coordinates (latitude, longitude, altitude) was developed. The data from 2016 Sprites campaign was processed and we found that the average maximum altitude, and altitude of maximum brightness, of sprites is approximately 85 and 69 km, respectively. We also found the correlation between the sprites maximum altitude and charge moment change (CMC).

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Prof. Michael Kosch
South African National Space Agency
mkosch@sansa.org.za

Primary authors: Mr MASHAO, Dakalo (South Africa National Space Agency); Prof. KOSCH, Michael (SANSA)

Presenter: Mr MASHAO, Dakalo (South Africa National Space Agency)

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