

First ground-based observations of sprites over South Africa

The South African National Space Agency recently recorded the first images of Sprites from Sutherland on 11 January 2016. Triggered by lightning, Sprites are optical gas discharges from the top of convective thunderstorm clouds at an altitude of 50-100 km.

"Despite being easily visible, nobody has ever reported seeing sprites over Southern Africa. We are extremely excited to have finally captured the first images of Sprites over South African skies" says Prof Michael Kosch, Chief Scientist at SANSA's Hermanus office in the Western Cape and the principle investigator on the Sprite project.

Using an NRF-funded night-vision TV camera the sightings were made possible from the South African Astronomical Observatory (SAAO) in Sutherland, one of the world's darkest astronomical sites.

The other team members involved in this exciting first sighting were Nnadih Stanislaus, a Masters student at the University of Cape Town (UCT), who operated the night-vision camera that captured the sprite images and his supervisor, Prof Peter Martinez of the UCT SpaceLab in the Department of Electrical Engineering.

"It was an amazing experience; seeing in real-time what has never being recorded over southern Africa. I felt like a hunter!" says Stanislaus.

Sprites occur in the upper-atmosphere and are very bright but brief flashes of light lasting between 1 – 10 milliseconds. They are always initiated by large cloud-to-ground lightning strikes during major thunderstorms. Predicted in 1925 by Nobel Laureate, Prof Wilson, they were first observed by chance in 1989 over the USA and have subsequently been observed frequently from spacecraft, aircraft and the ground. Given the millions of lightning strikes that occur annually, the rarity of the reported sightings is surprising.

"These observations pave the way for more comprehensive observations at multiple wavelengths to improve our understanding of how sprites are triggered and their effects on the upper atmosphere," says Martinez.

The geographic location and infrastructure of the SAAO facilities in Sutherland have been identified as one of the most suitable sites to provide the ideal visibility conditions for recording Sprites in South Africa. SAAO has entered into a four year agreement with SANSA to host a state-of-the-art Optical Space Research (OSR) Laboratory which will be used for further research into Sprites as well as new research in atmospheric gravity waves.

"We will be using the OSR initially to study atmospheric gravity waves that will provide us with greater insight into the dynamics of the Earth's middle atmosphere," says Prof Kosch. "Such knowledge is important because the middle atmosphere couples space weather from above to terrestrial weather below".

The unique capabilities of the OSR Laboratory will provide crucial space science data to meet national and international obligations, raise the standard of South African research, supply information about unanswered scientific questions and enhance scientific development.

Ends

Impact of research into sprites

Research into the Earth's atmosphere and ionosphere are crucial for understanding our universe and the interconnected processes and dynamics that govern our natural environment and the technologies we rely on. Space weather is an area of research that is equally relevant to developed and developing nations due to our increasing reliance on space-based systems and the continued use of high frequency long-range communications.

Images and Captions



Figure 1 shows the first South African image of an isolated carrot sprite, initiated by a single lightning strike, approximately 300 km north-east of Sutherland.



Figure 2 shows the first South African image of a cluster of sprites, probably initiated by a series of lightning strikes. These thunderstorms occurred approximately 300 km north-east of Sutherland.



Nnadih Stanislaus, a Masters student at the University of Cape Town (UCT) who operated the night-vision TV camera that captured the first images of sprites in South Africa.