



Lightning Observations in South Africa

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South Africa has been the place of pioneering studies of lightning discharges (e.g., Proctor et al., *J. Geophys. Res.*, 1988, Schonland et al., *Proc. Roy. Soc. A*, 1940). Large thunderstorm systems frequently occur in the north-east of South Africa during the northern hemisphere winter in January and February. Here we report low frequency radio measurements from the South African Astronomical Observatory (SAAO) near Sutherland and from Carnarvon further north in the Karoo desert which is close to the core of the Square Kilometer Array (SKA) build for radio astronomy. It is found that the electromagnetic environment in South Africa is undoubtedly pristine when compared to Europe such that practically undisturbed lightning waveforms can be recorded. In particular, it is possible to determine the envelope and phase of lightning pulses by using the entire bandwidth of a low frequency radio receiver from ~ 4 Hz to ~ 400 kHz (Fullekrug, *Meas. Sci. Tech.*, 2010). This exceptional radio quiescence enables detailed studies of the ground wave and numerous (~ 5 -15) sky wave arrivals from lightning discharges that occur in a thunderstorm ~ 600 -800 km away in the north-eastern part of South Africa. The measurements are compared to the lightning waveforms collected by the commercial Earth Networks Total Lightning Network (ENTLN) which uses receivers that have a bandwidth reaching up to ~ 10 MHz. Particular emphasis is placed on a comparison of cloud-to-ground and intra-cloud lightning discharges and the sky wave propagation of their radio pulses.

References

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