Analysis and Comparison of AWESOME Detected VLF Perturbations

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Outline

Analysis of Algeria AWESOME results

  Association between TLEs and Early VLF signal perturbations
  Are TLEs the unique cause of early VLF perturbations?

Comparison between Algeria and Libya AWESOME results

  Can we observe an Early event by distant receiver?

Conclusions
12-13 October Events

Sprite at 23:04:41 (38.06N 3.83E)

Sprite at 22:51:35 (36.59N 3.32E)

Elves at 00:32:00
$T_{ons} = 198\text{ms}$

$T_{ons} = 180$
Direct Paths

Scattered Paths

Circles Lightning near to the Elves time

\[ T_{on} = 180\text{ms} \]

\[ T_{on} = 120\text{ ms} \]
October 17-18 events

Sprite at 21:28:27 (40.1N 4.55E)

Sprite at 20:59:32 (39.98N 4.51E)
The events were well situated for multi frequencies observations
Sprite at 23:09:48

- $T_{ons} = 48 \text{ms}$
- $T_{ons} = 40 \text{ms}$
- $T_{ons} = 258 \text{ms}$
Sprite at 01:43:59

$T_{ons} = 198\text{ms}$

$T_{ons} = 138\text{ms}$

$T_{ons} = 318\text{ms}$
Are TLEs the unique sources of VLF signal perturbations?

Last TLE was at 03:54:25
234mn after 00:00

No TLE was observed during
this time interval

What could be the sources of these perturbations?
No Signal perturbation was observed by the receiver at Sebha even though the CG locations were near the GCPs from HWU, GQD and NRK to Sebha.
Near receiver results showed that Early VLF perturbation due to TLE may have different scattering process.

The scattering process plays an important role in determining the onset time and the amplitude of the VLF signal perturbation.

In absence of TLEs, supplementary ionization can occur due to Lightning discharges which can affect the VLF signal.

Sebha (Libya) AWESOME receiver results showed clearly that not all the VLF perturbations survived the long distance to the receiver, even if the activity is close to the GCP.