

DEMETER : RESULTS and CHALLENGES

M. Parrot LPC2E/CNRS, Orléans



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6.5 years of data Altitude 660 – 700 km Two LT (10h30 – 22h30) Plasma waves and densities

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- 1. Seismic activity
- 2. Man-made activity
- 3. Thunderstorm activity



Seismic activity



Electric field map







Night time VLF Electric field between 1055 – 2383 Hz



with M > 5.0 and d < 40 km



Pisa et al. (JGR, 2011)





We observe a decrease of the electric field at ~ 1.7 kHz during night time This is the frequency cutoff of the Earth-ionosphere waveguide f = c/2h (h= 90 km)

















Man-made activity



Sauvaud et al., GRL, 2008

The frequencies of lines are close to 3603, 3711, and 3808 Hz, which means that the frequency interval is approximately equal to 100 Hz.

Thunderstorm activity

OTD data, Colman and Starks, JGR, 2013

DNEPR

Fiser et al., Ann. Geophys., 2010

Effects of the thunderstorm activity on the ionosphere

Automatic detection of intense waves

VLF electric data in survey mode (up to 20 kHz, time resolution 2s.)

Intensity between 9 and 10 kHz Intensity between 4 and 5 kHz Not at high invariant latitude Burst and/or Survey

What could be the cause of such density perturbations ?

-Electron precipitation due to whistler waves

-Whistler waves

What could be the cause of such density perturbations ?

- -Electron precipitation due to whistler waves
- -Whistler waves
- -Link with a sprite

Sprite data from Serge Soula

Position of DMT at the time of the lightning stroke

17/11/2006 20:52:42 2526533 5,3471 44,58 109200

Spectrogram

Hour (UT) µs	lat	long	A
19:29:21	7119217	4,851	44,1049	77300
19:44:51	3264650	4,7853	44,333	83200
19:50:17	137949	4,7807	44,378	104500
19:50:17	1541844	4,6716	44,6832	53400
19:57:29	4213629	4,8244	44,6825	52900
20:01:03	6943259	4,8773	44,1881	54600
20:03:43	4388403	4,9819	44,7632	116800
20:07:56	7688636	4,9701	44,4604	76500
20:11:01	9779061	4,6365	44,4837	55500
20:15:52	9067169	4,9236	44,5048	107200
20:15:52	9539847	4,7719	44,6222	112200
20:21:43	7457350	4,7309	44,467	82100
20:25:57	5093498	4,9657	44,8503	165800
20:42:05	6411427	5,0709	44,4101	76700
20:52:42	2526533	5,3471	44,58	109200

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Conclusions

The list of DEMETER published papers are on http://smsc.cnes.fr/DEMETER/Fr/A_publications.htm