

# Epsilons, Cs, Corkscrews, and Co

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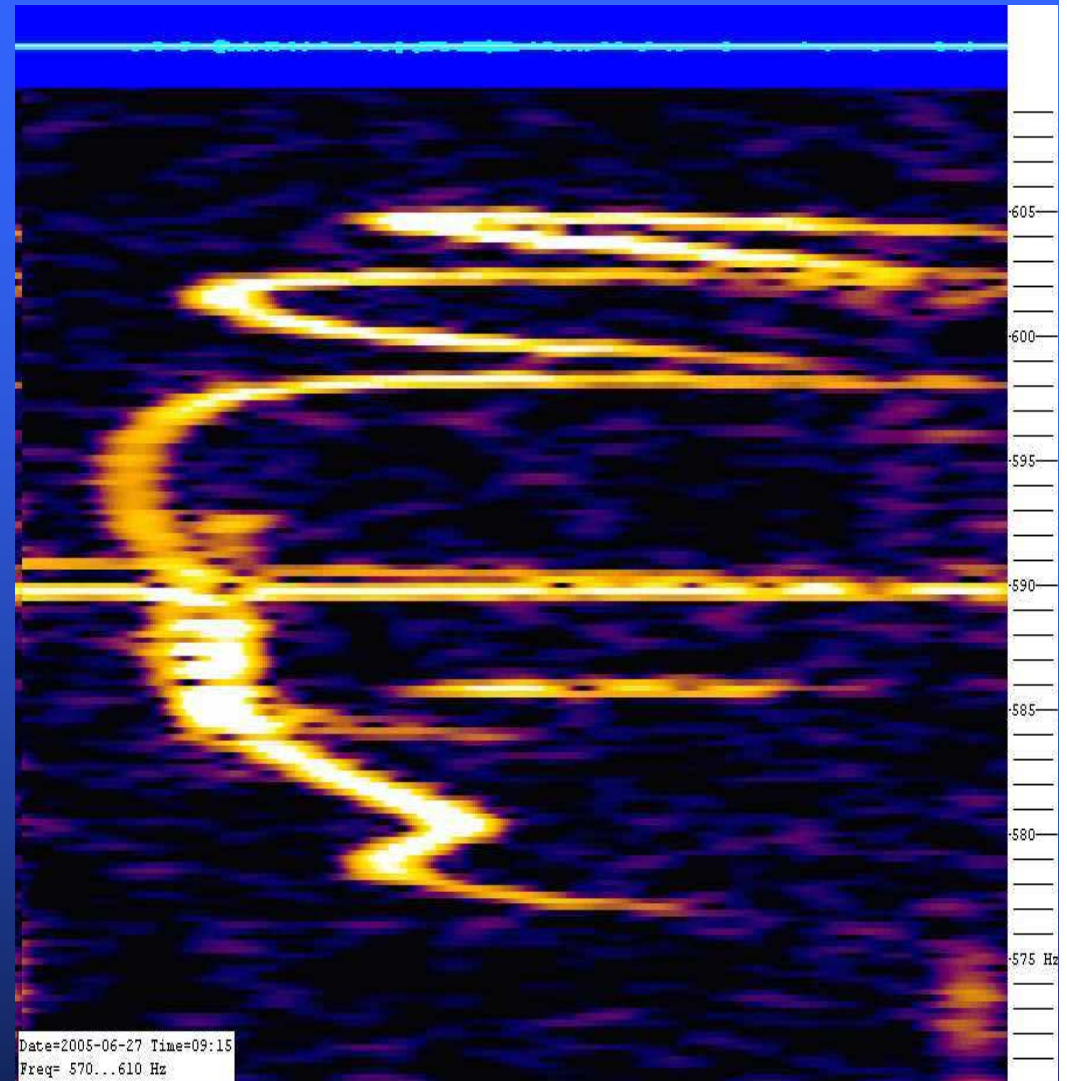
**Société Astronomique  
de France**

Commission Radioastronomie



**International Meteor  
Organization**

Radio Commission



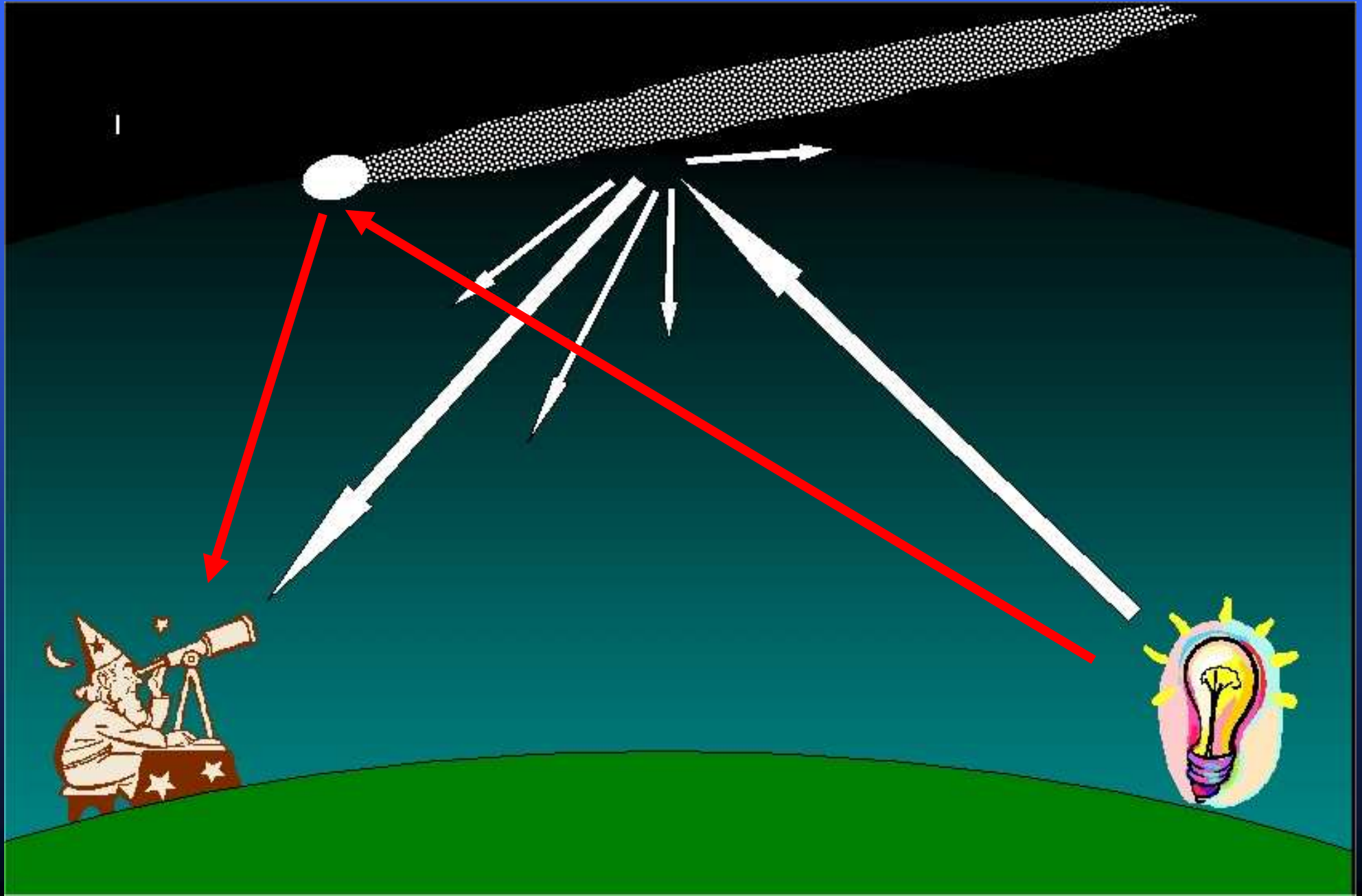
**IMC, Armagh , UK, September 2010**

Free electrons created during the ablation phase of a meteor are able to reflect radio waves.

The detailed frequency structure of a radio echo can be used to observe the movements of the reflecting ionized parts (meteor body and meteor trail).

Useful information (and many questions!) can be deduced from the meteor radio signatures ...

# Radio forward scatter (bistatic) mode



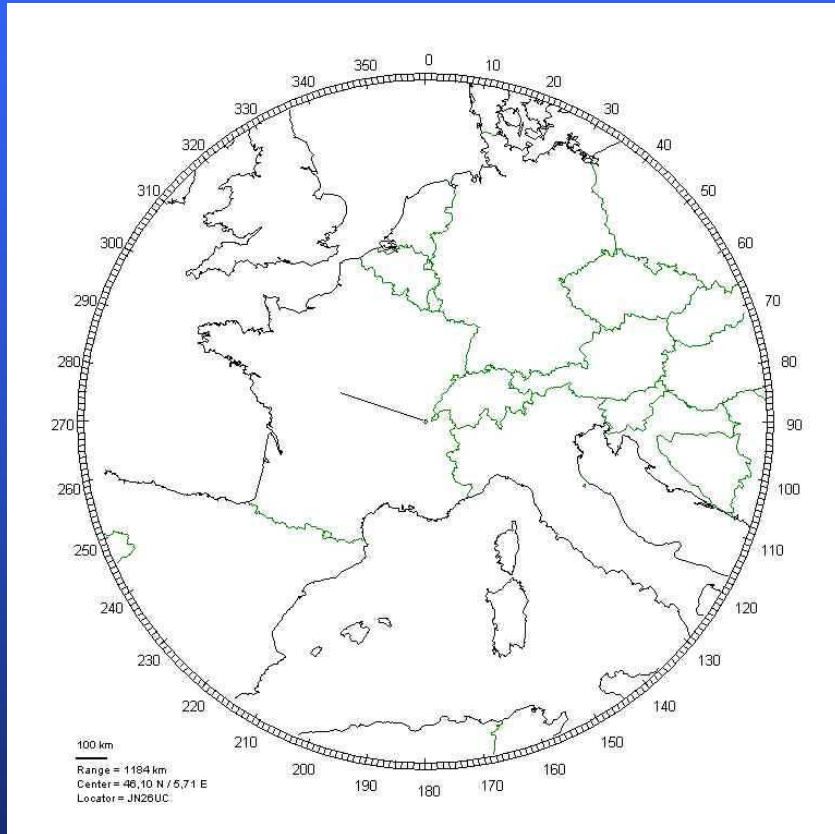


# Observational set-up: short base

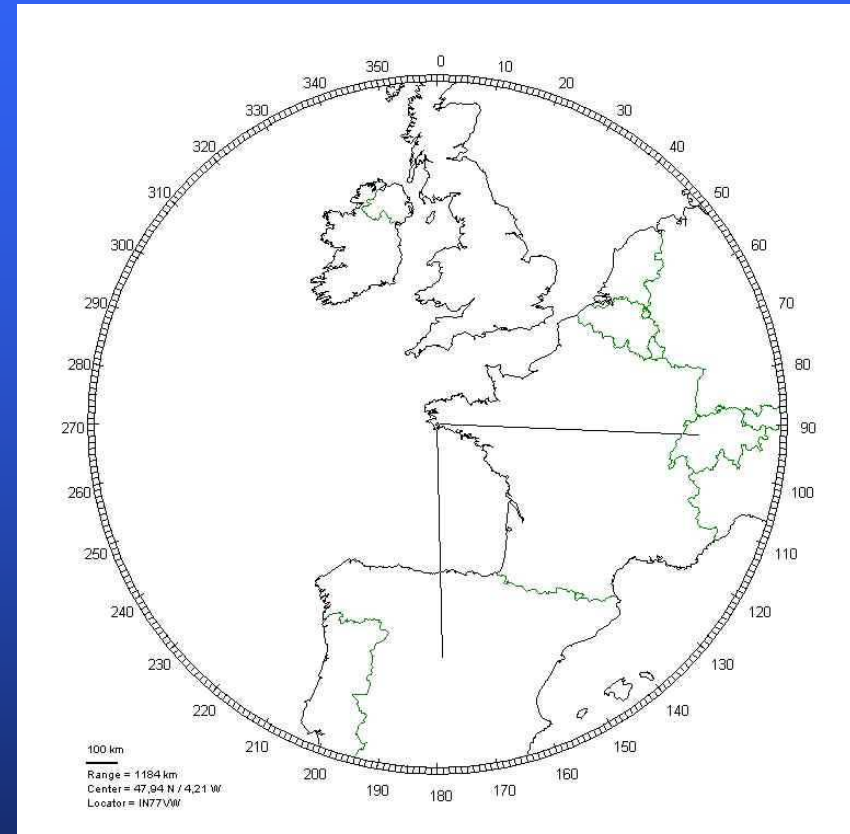


100 km

# Observational set-up: medium and long base



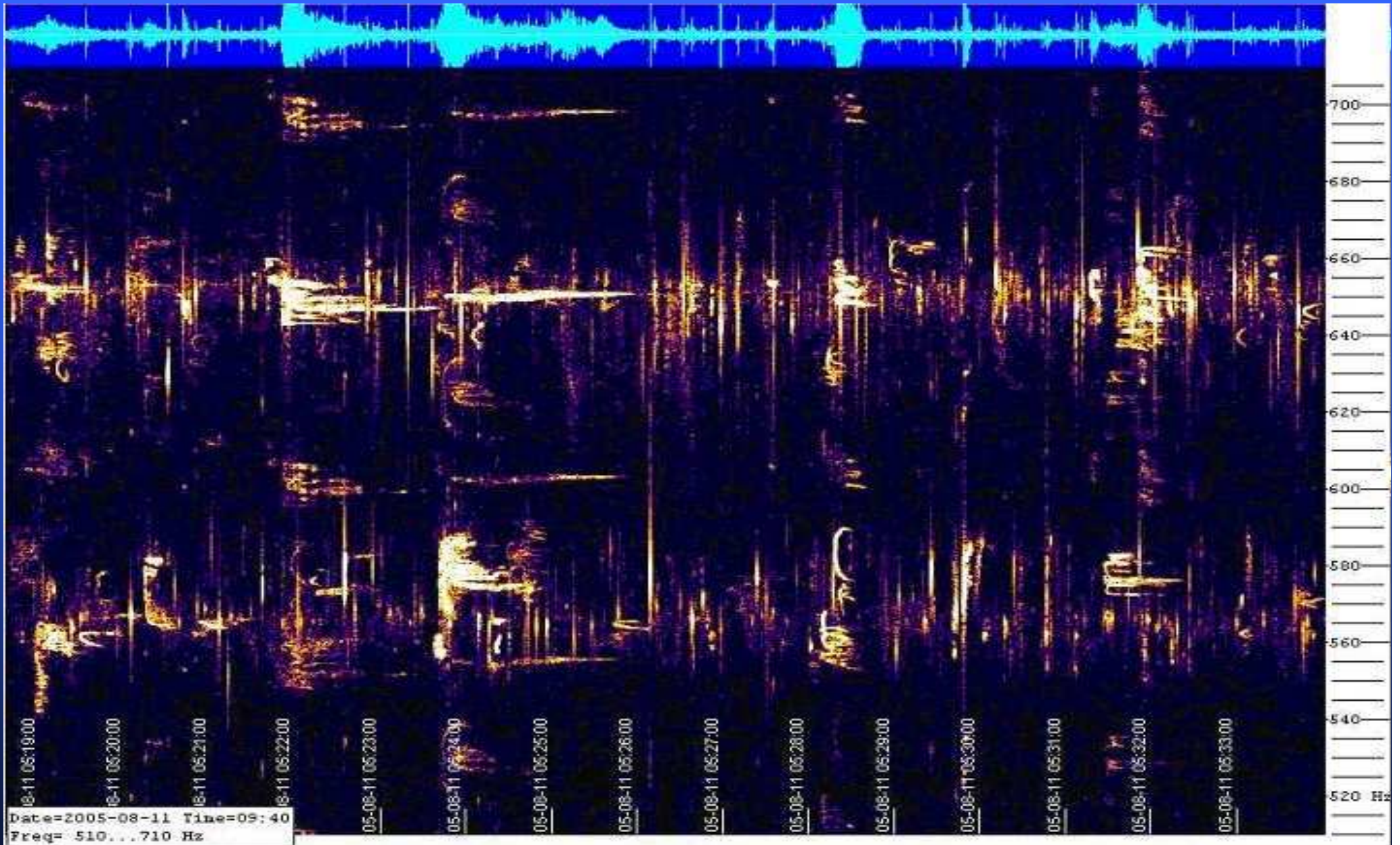
~ 300 km



~ 1000 km



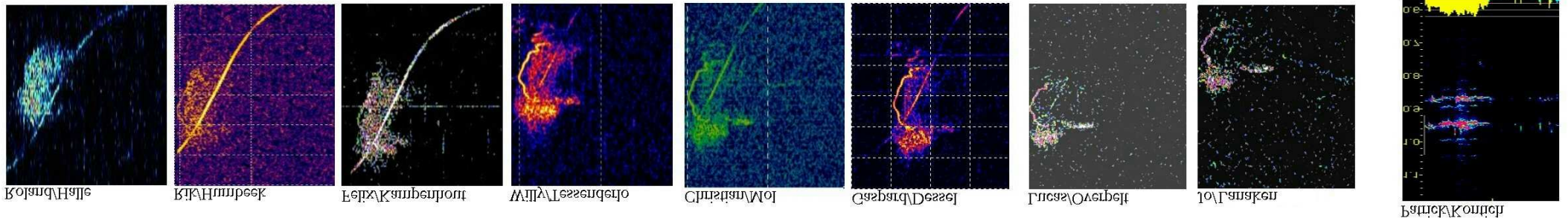
# The meteor echoes zoo



Perseids 2005. Single observer (JLR-Brittany) / Multi transmitters

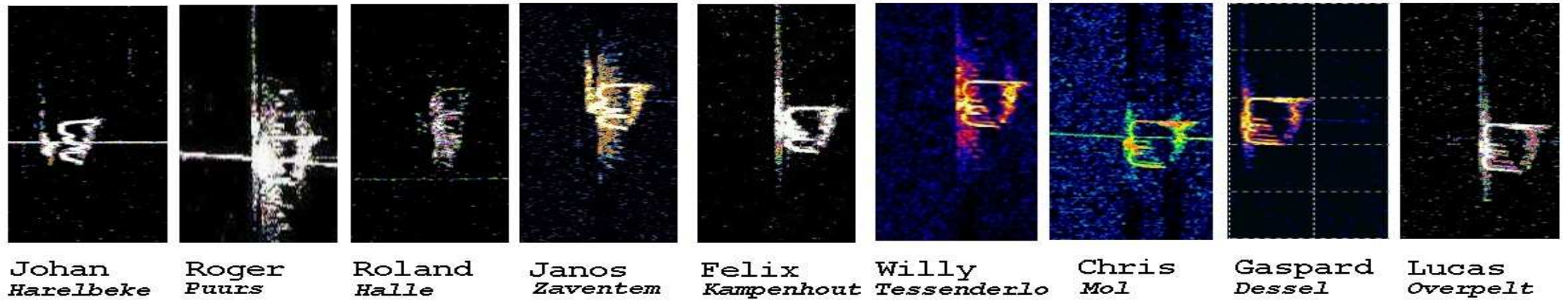


# The Belgian network



5000055310523 (mirrored)

49.99 MHz - 200912050427

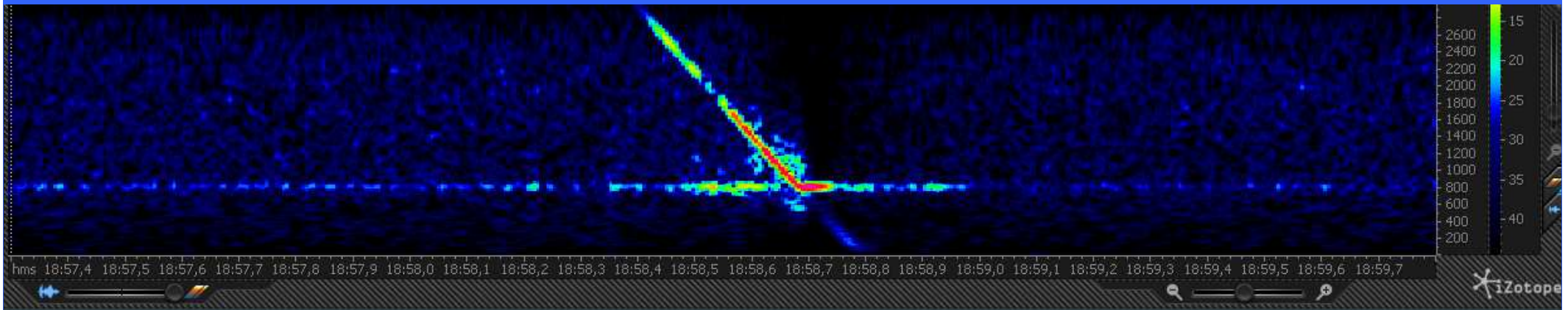


49.99 MHz - 5000055310523

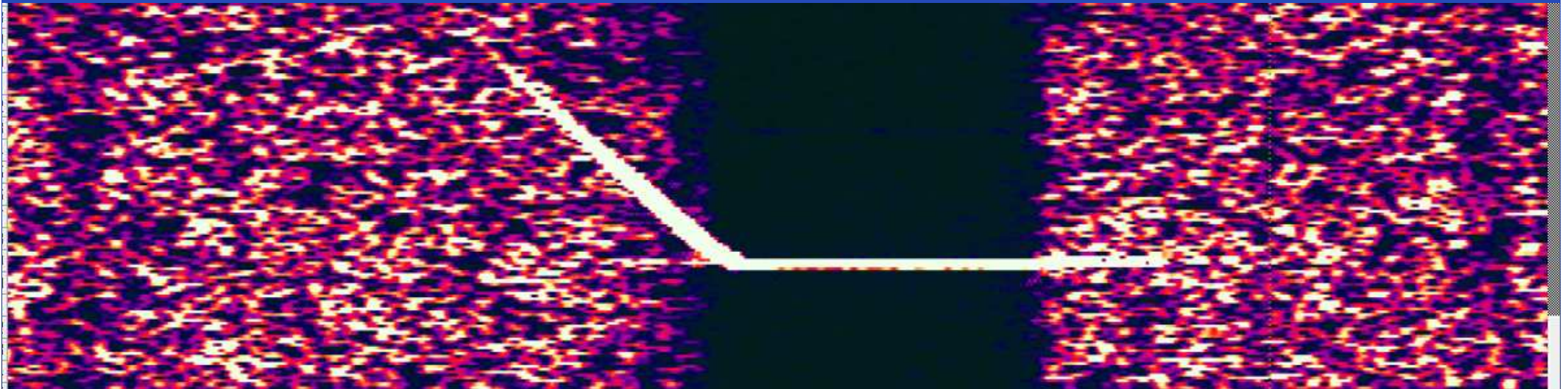
Yper 50 MHz beacon observed by separate VVS observers



# Head echo



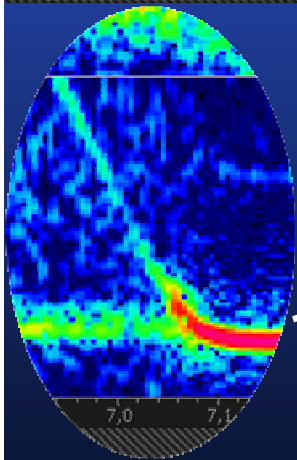
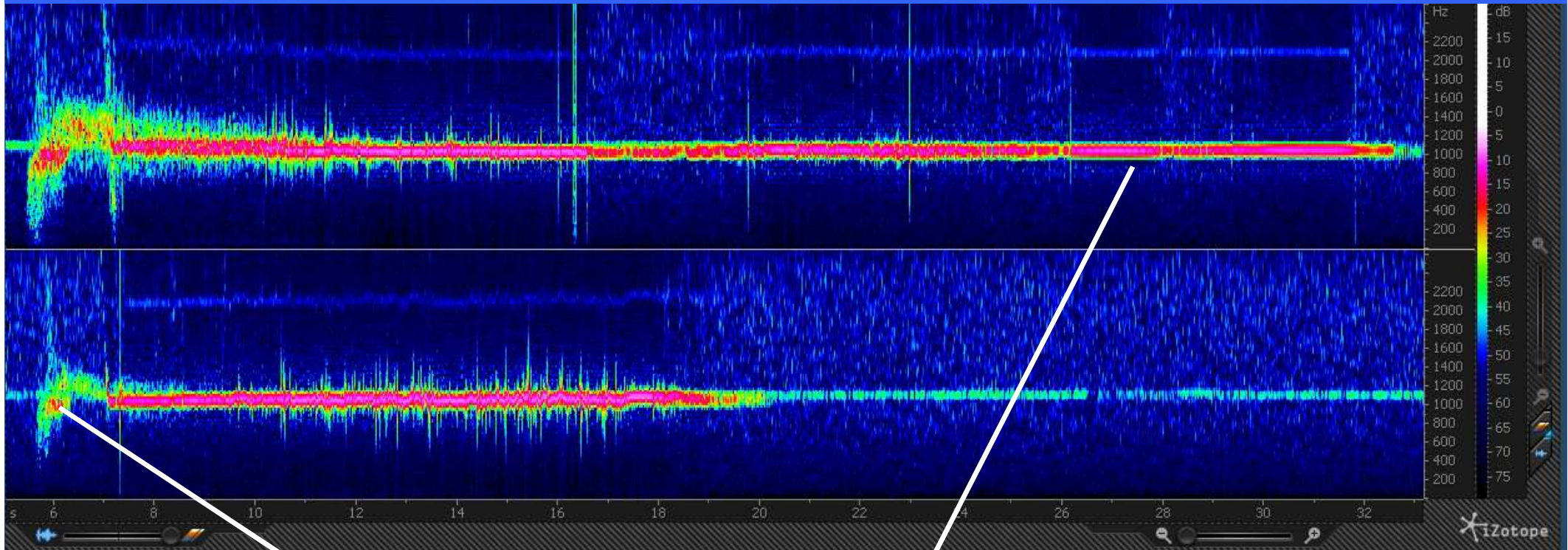
# Head and tail echo



Single observer (JLR @ Obs. de Haute-Provence) / Single transmitter (GRAVE)



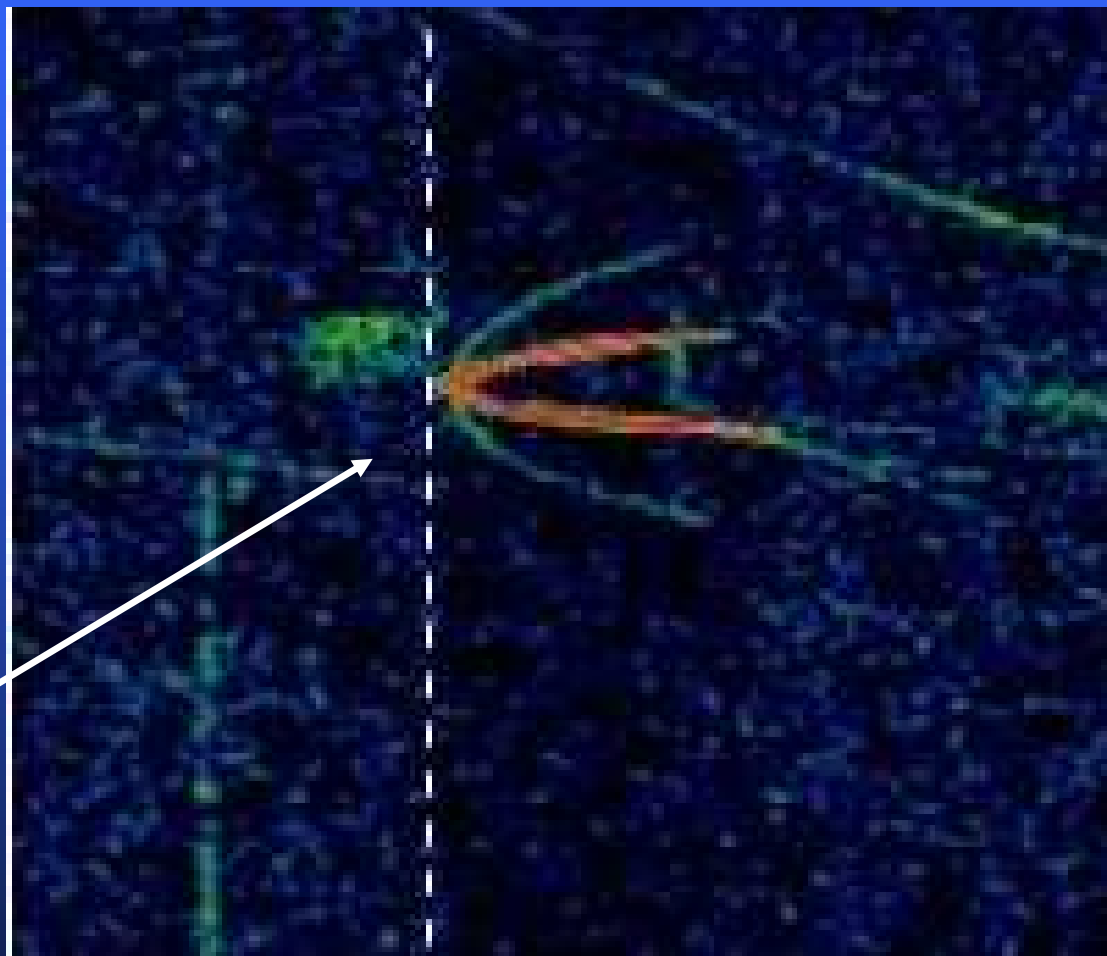
# Two different fireballs observed at a 42 mn interval



1. Turbulent phase
2. Head echo
3. Overdense trail

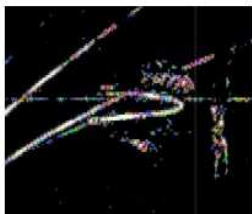
Single observer (JLR in Xaintrie Noire) / Single VHF transmitter (GRAVE)

# The C shape



Yper 50 MHz beacon observed  
by separate VVS observers

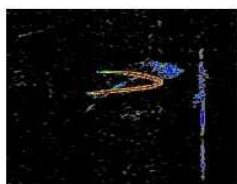
cs009100d1331\_comp



Johann



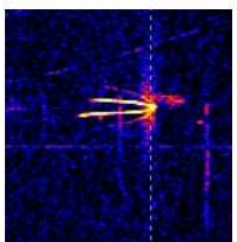
Roland



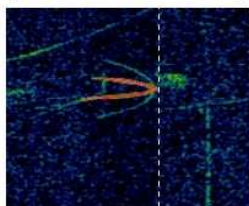
Janos



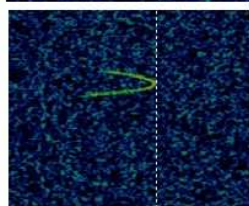
Felix



Willy

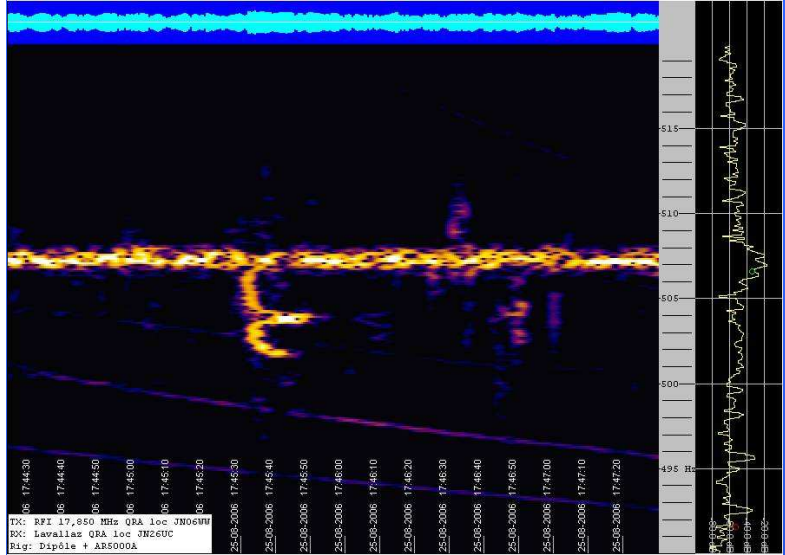


Chris



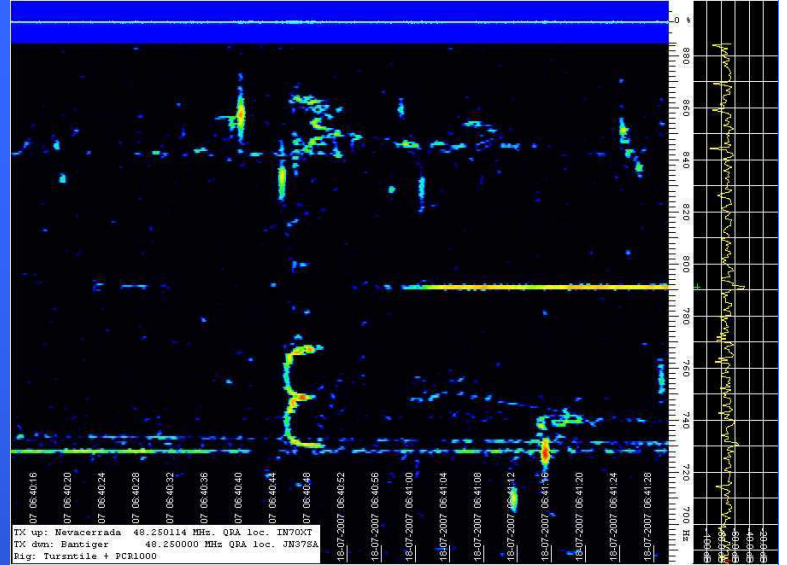
Lucas



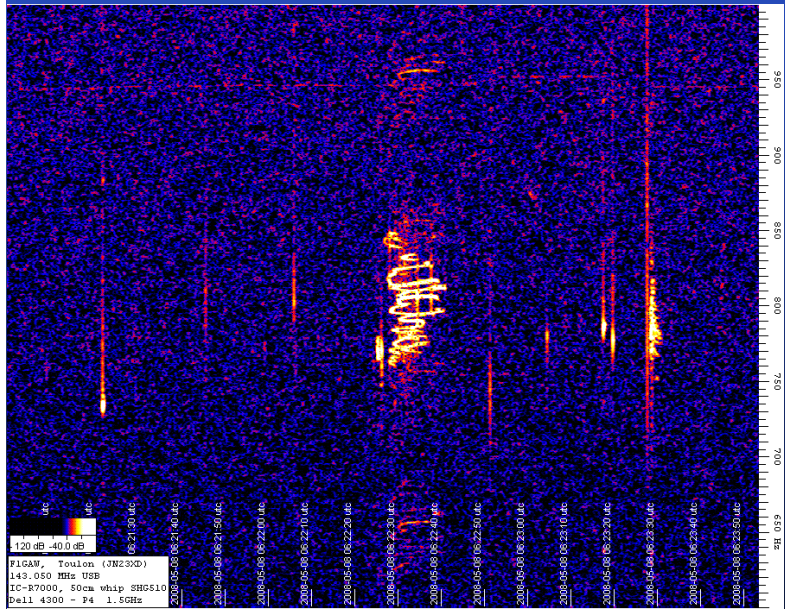


JLR (nr Paris) / RFI 17 MHz

The  $\epsilon$  shape

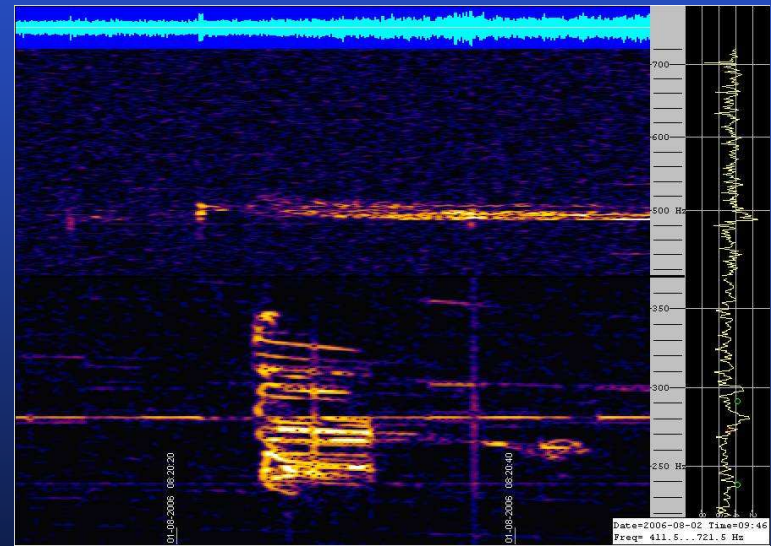


JLR (nr Paris) / Budapest 48 MHz



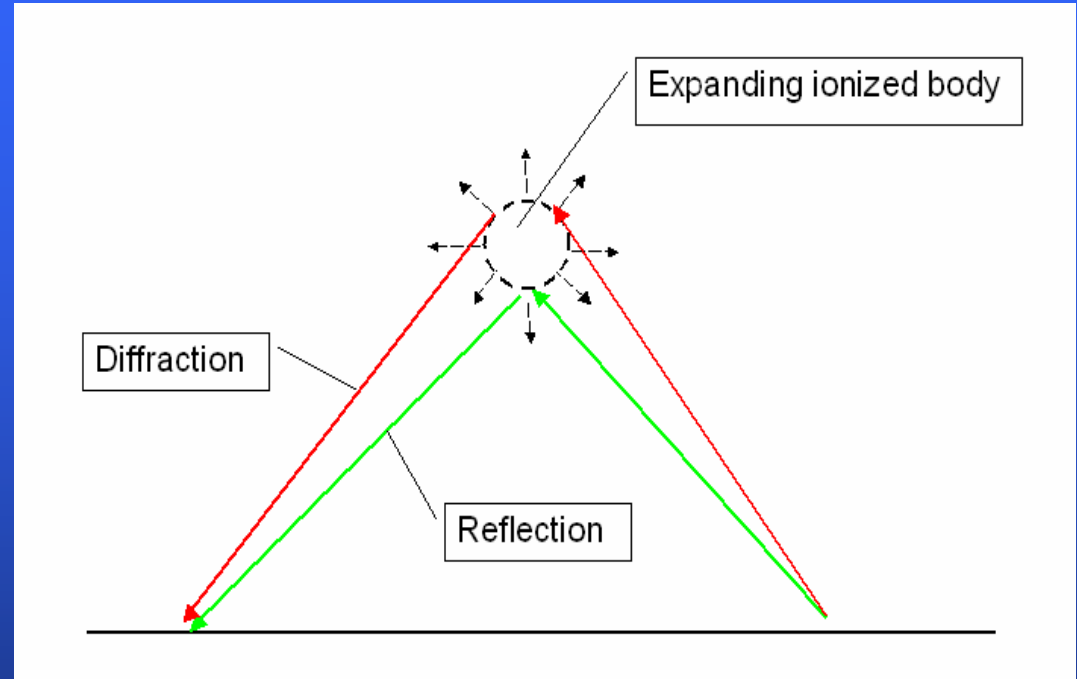
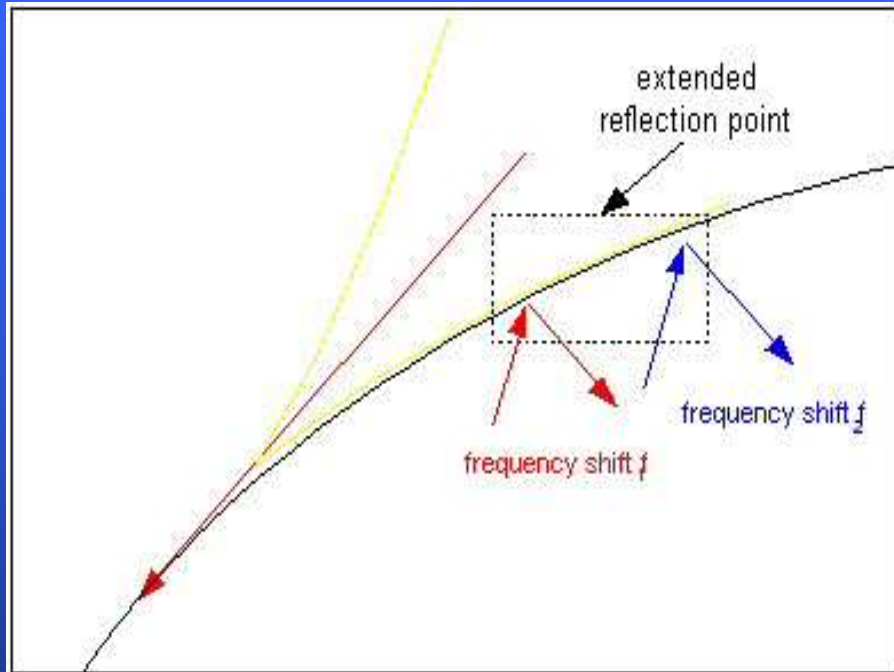
AG (Toulon) / GRAVE 143 MHz

Corkscrews



JLR (nr Paris) / 48 & 143 MHz

# Some current discussions ...



Ambipolar diffusion effects ?

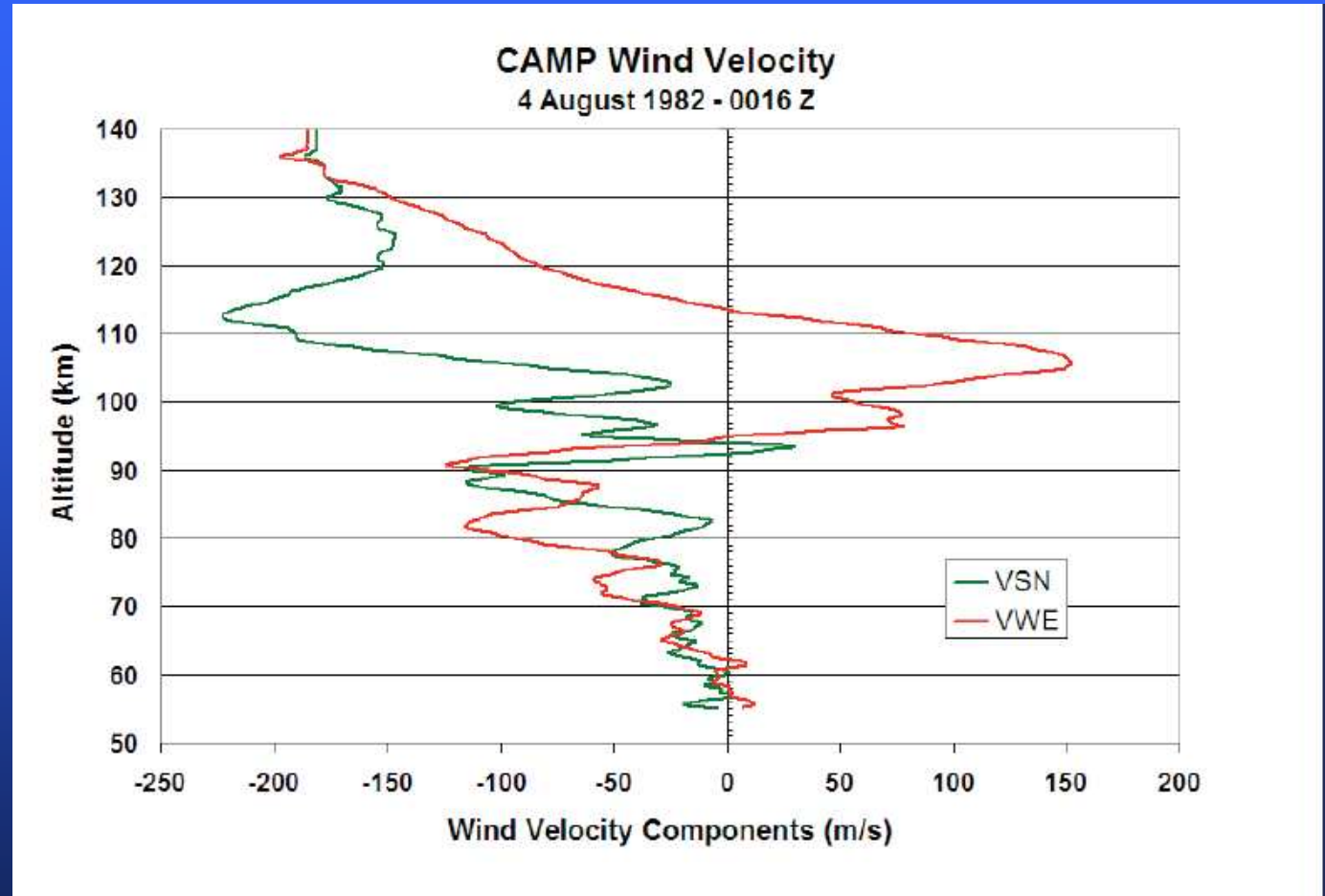
(David Entwistle, Chris Stayert proposals)

Combined reflection/diffraction ?

(Jean-L. Rault)



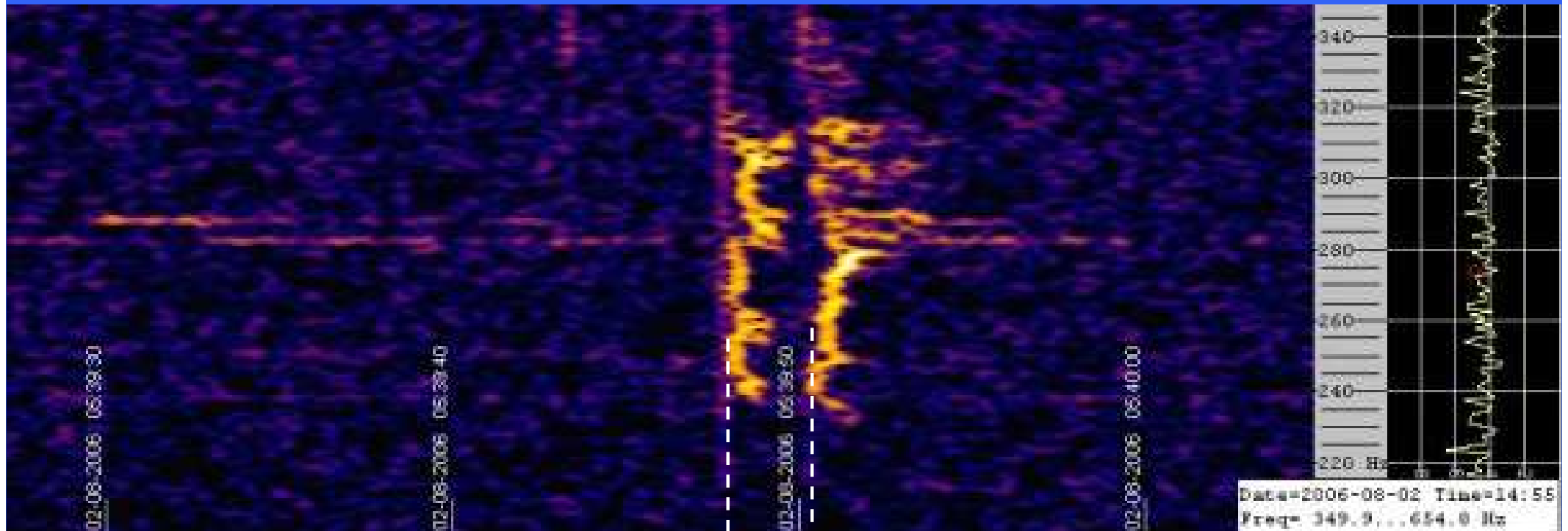
# High altitude winds effects ?



Example of a distorted trail

Zonal and meridian winds

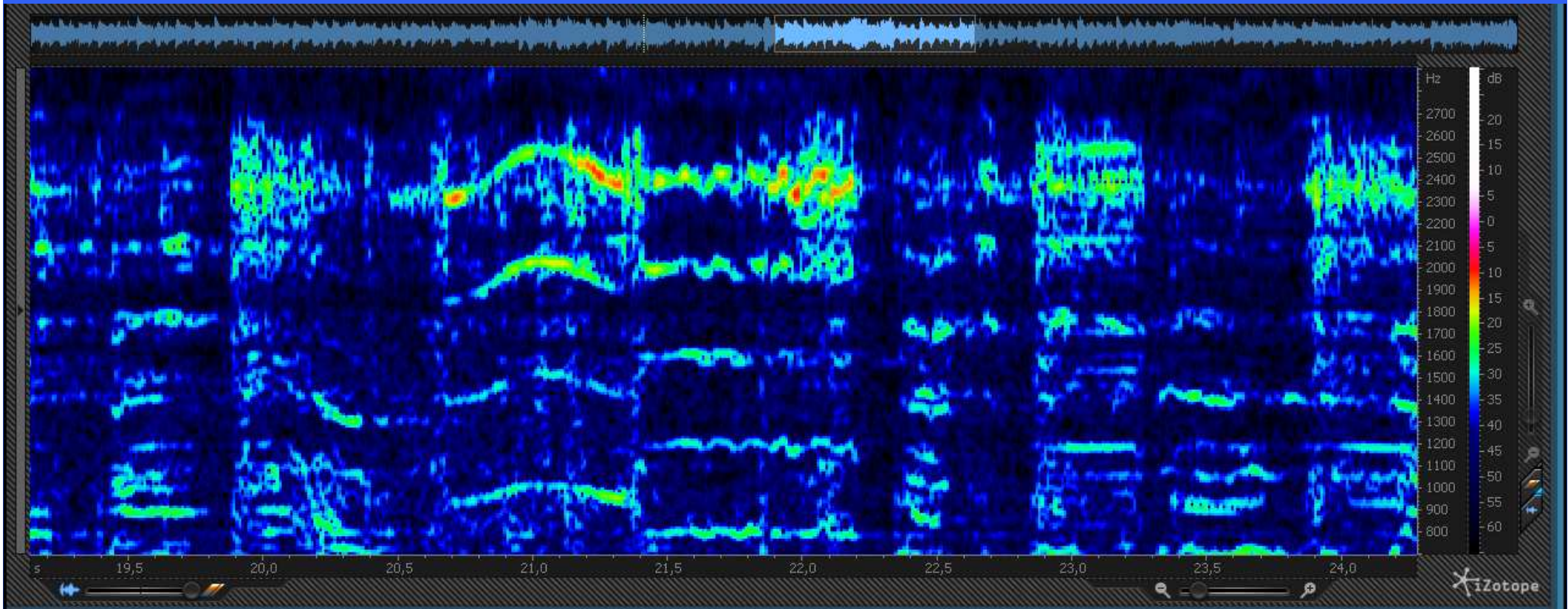
# Wind induced corkscrews ?



JLR (nr Paris) / GRAVE 143 MHz



????



Sgt Pepper's Lonely Hearts Club Band  
(The Beatles)

The conclusion is ...

We need more theories !!

Нам надо больше теории

