



BRAMS, the Belgian Radio Meteor Stations : latest developments

Hervé Lamy

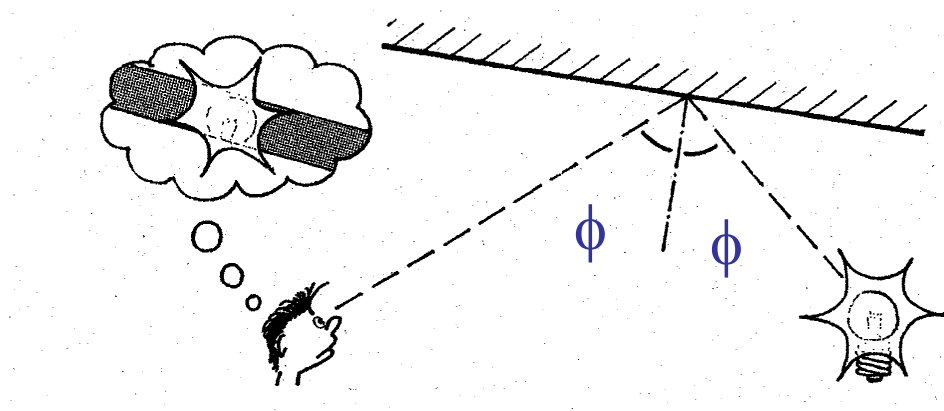
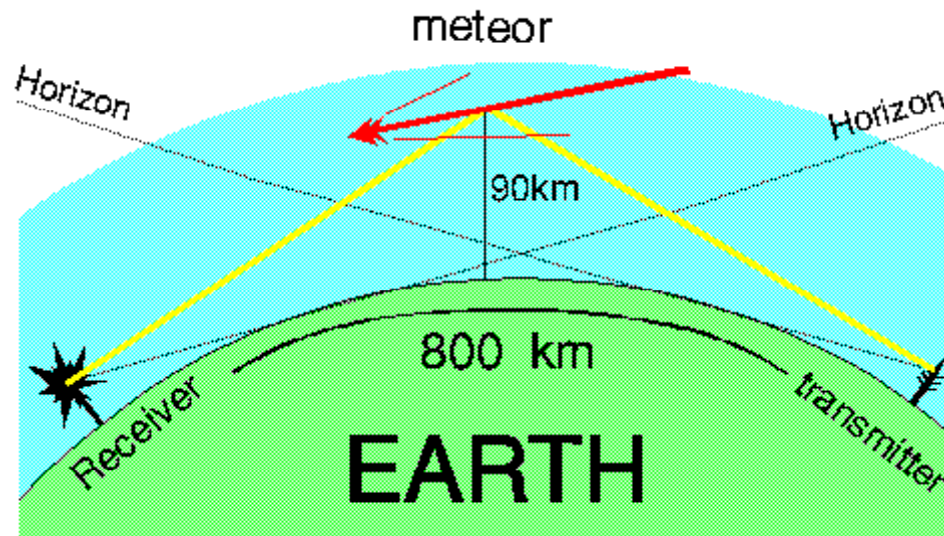
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BRAMS team



- Hervé Lamy
- Sylvain Ranvier
- Emmanuel Gamby
- Stijn Calders
- Michel Anciaux
- Johan De Keyser
- Yves Geunes

Radio forward-scattering observations

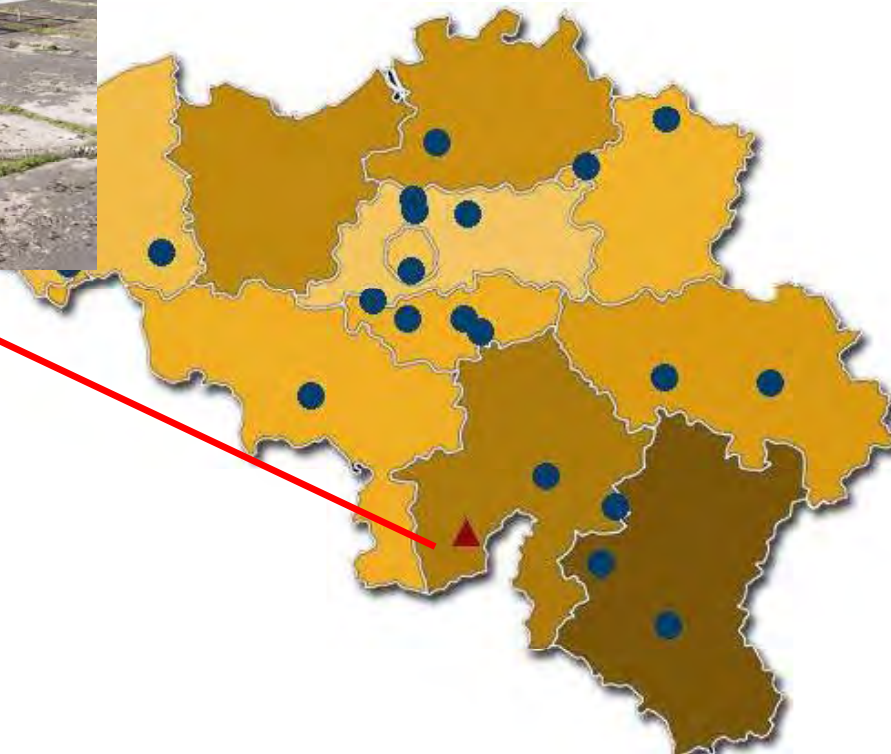


Wislez et al (1996)

Network of 22 radio receiving stations



+ Jean-Louis



Future stations :

- Genk
- Leuze
- Oostende
- Seneffe
- Lille

A typical receiving station



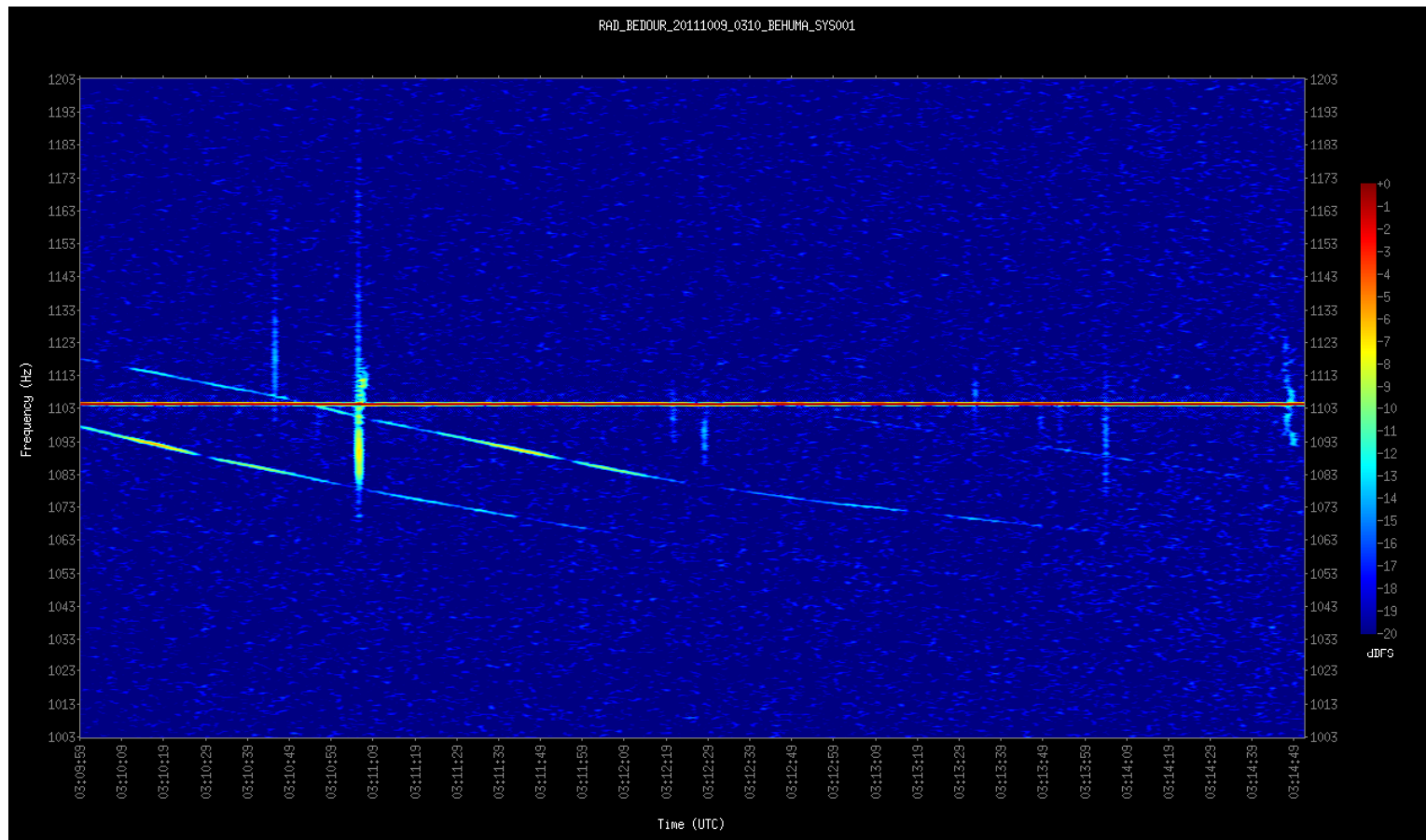
AGC switched off



Spectrograms

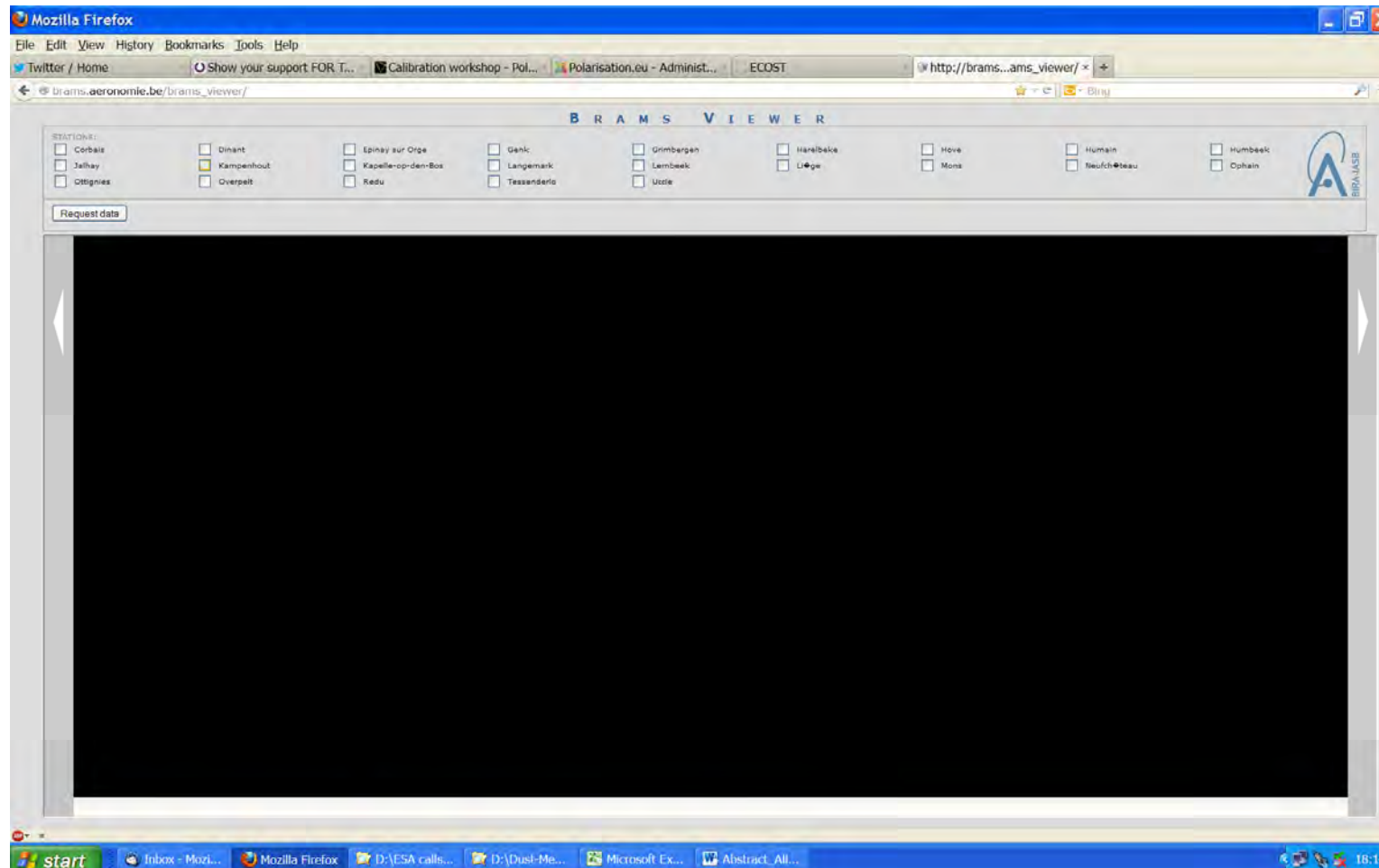


Data saved in WAV files, sent to BISA by USB sticks and archived



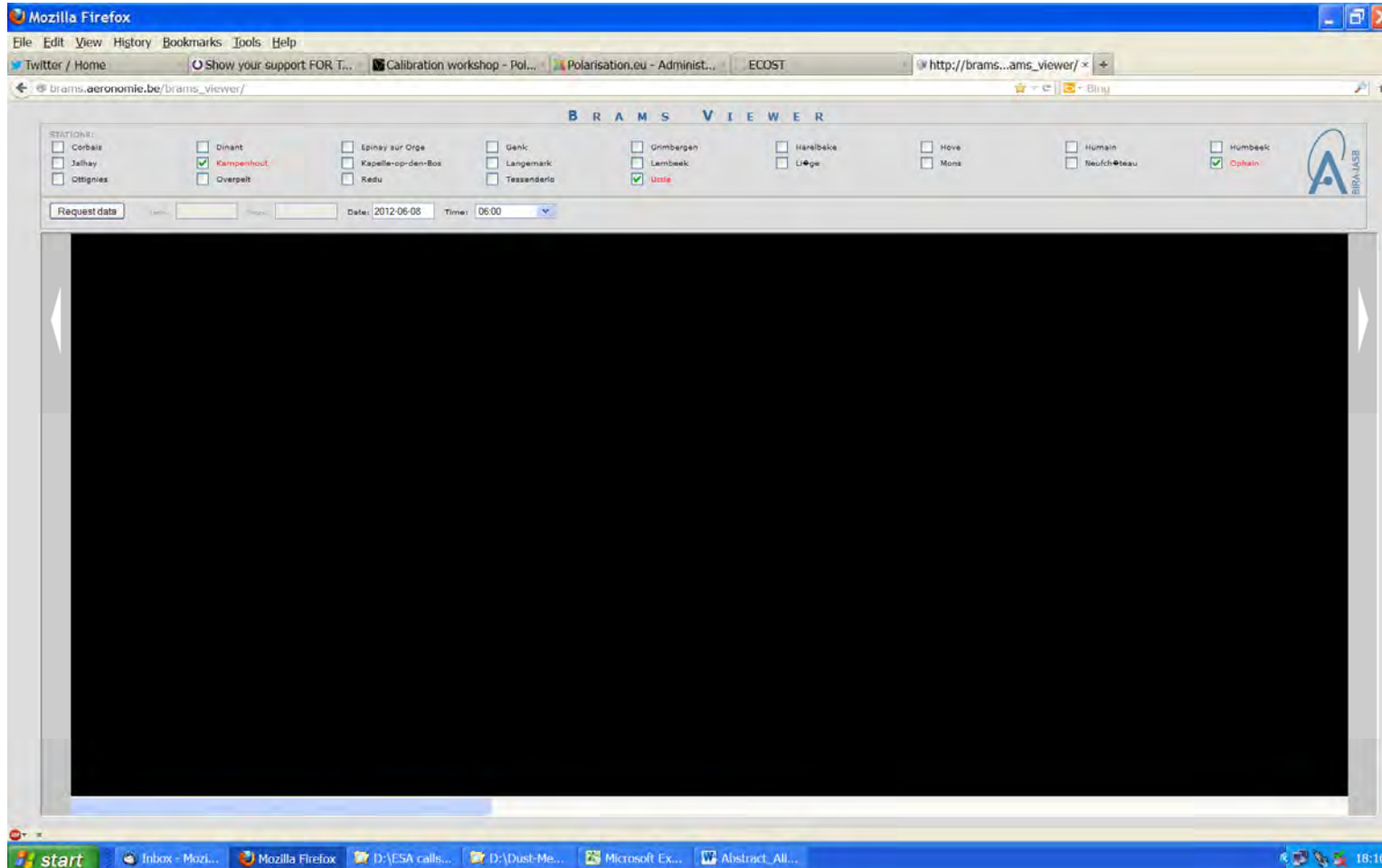
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The BRAMS viewer (1)



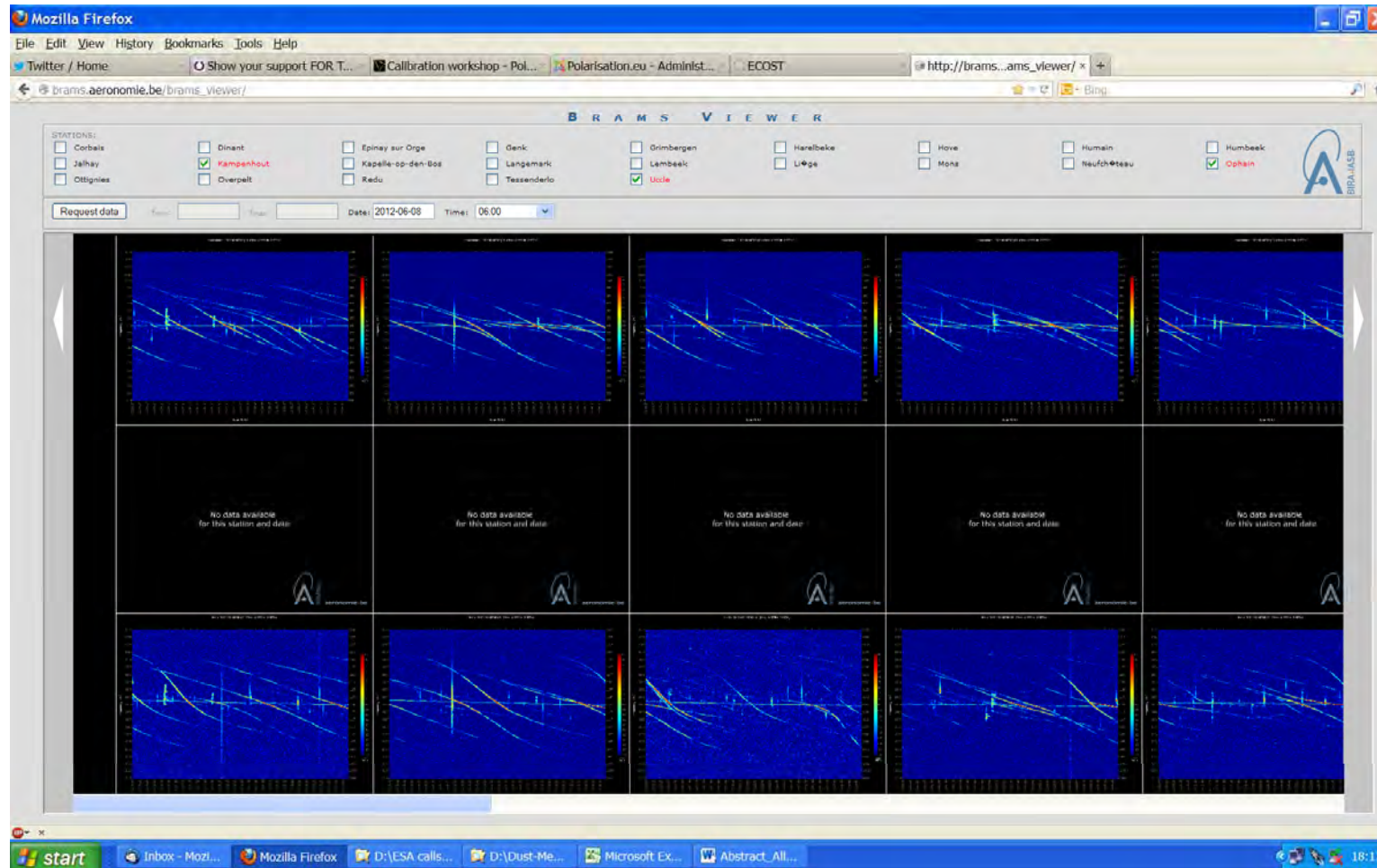
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The BRAMS viewer (2)

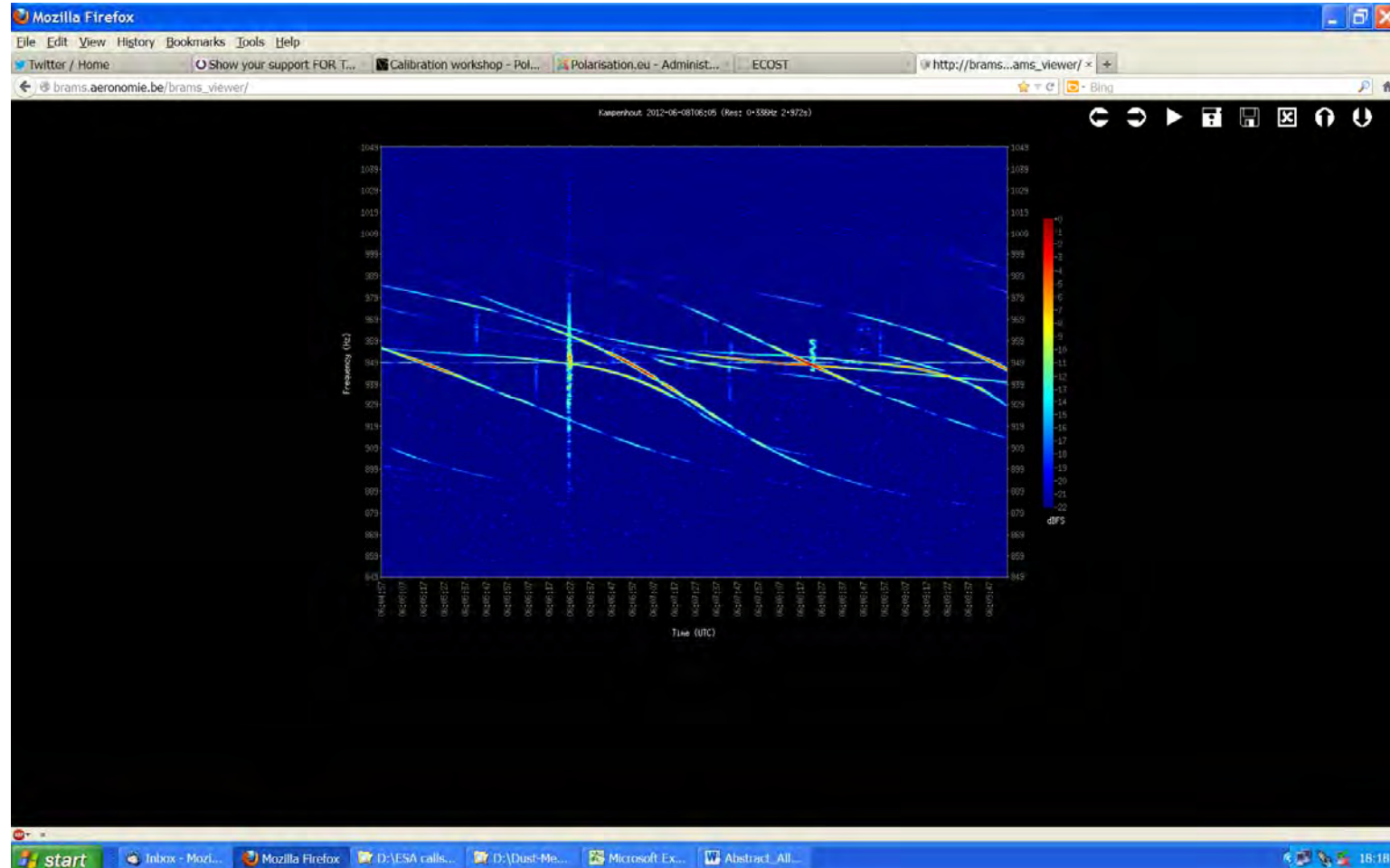


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The BRAMS viewer (3)



The BRAMS viewer (4)

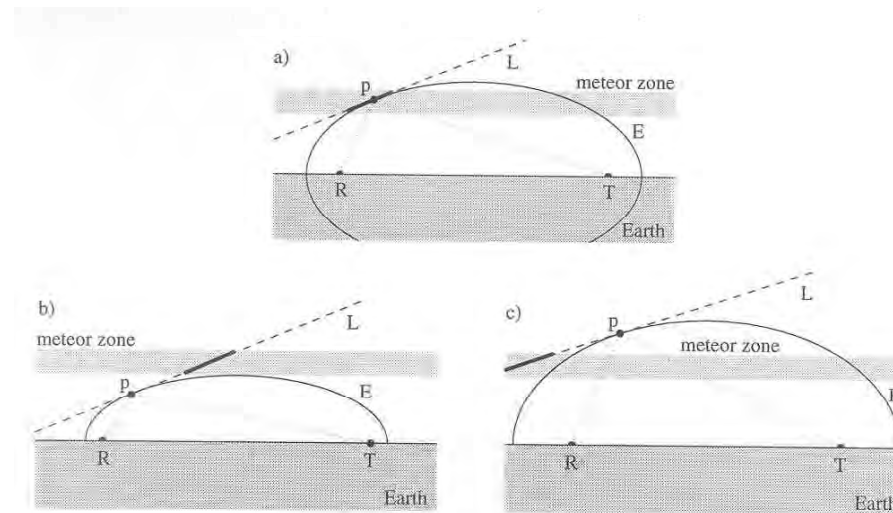


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Determination of trajectories



- From multi-stations observations of the same meteor
- Meteor path must be tangent to a set of ellipsoids whose focii are the transmitter T and the various receiving stations R_i (Nedeljkovic 2006)



Determination of trajectories (2)

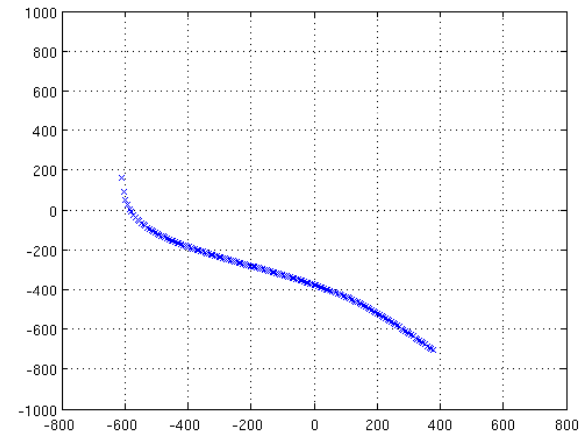


- Student from ULB
- « Direct » problem : find the position of specular point knowing positions of T , R_i and meteor path + calculate Δt
- « Inverse » problem : among « all » possible meteor paths, find those who are tangent to a number of ellipsoids knowing T and $R_i \rightarrow$ many many solutionsdecreases slowly with number of stations.
- To be done : take into account the real Δt observed (difficulty : be sure we're talking about the same meteor..)

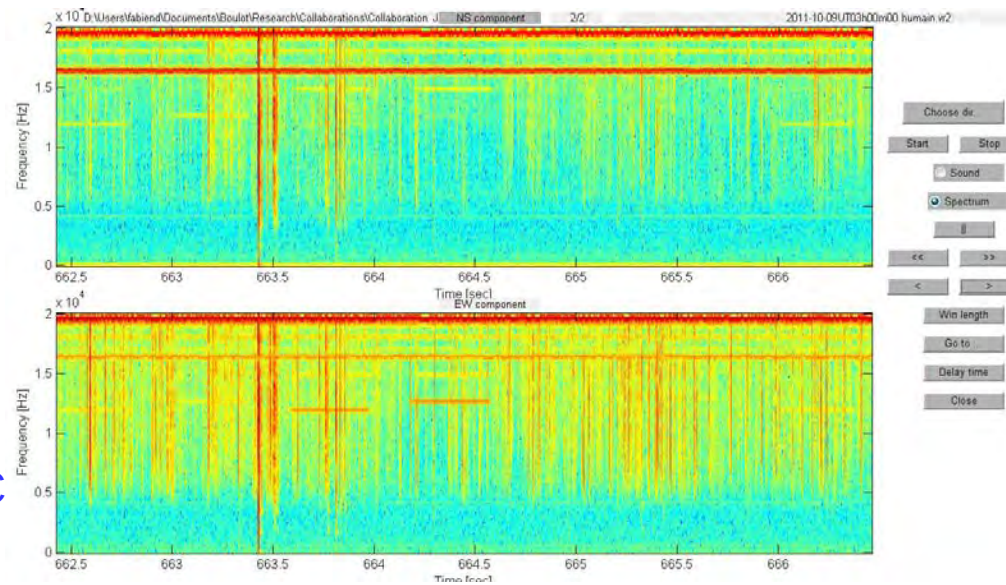
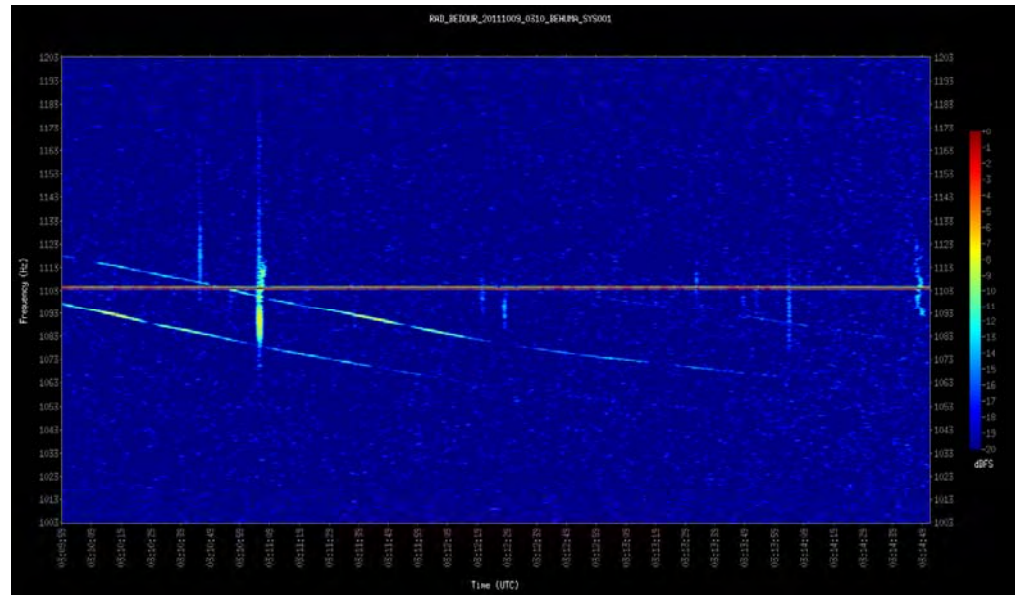
Other works in progress



- Calculation of the OF for meteor showers (see presentation of Stijn Calders and early application to the Draconids 2011)
- Radio polarisation measurements of meteor trail echoes (see presentation of Sylvain Ranvier and application to the Perseids 2012)



VLF/VHF observations of meteors

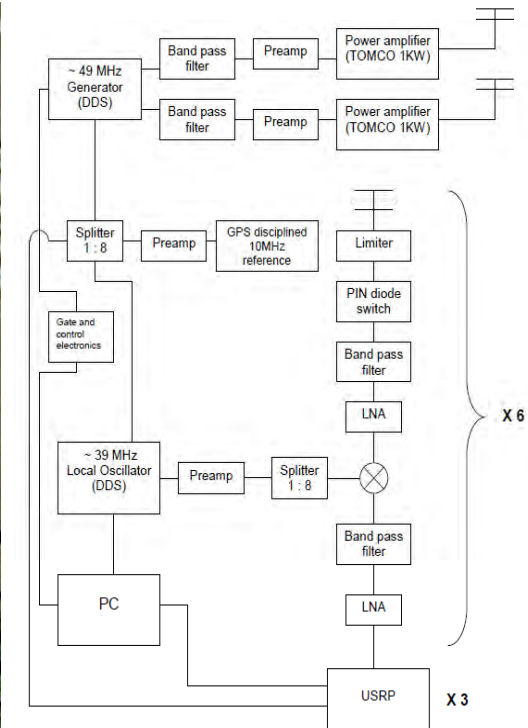


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Meteor radar in Dourbes



- Goal : study of meteors, comparison of fluxes with forward & back scatter systems
- Status : preliminary design done, material is being procured, work should start in spring 2013



BRAMS : the website



What is BRAMS?


BRAMS (Belgian Radio Meteor Stations) is a set of radio receiving stations using forward scattering techniques to study the meteoroid population. The project is coordinated by the Belgian Institute for Space Aeronomy (BISA), in the frame of the Solar-terrestrial Centre of Excellence (STCE). Most stations will be run by Belgian radioamateurs or groups of amateur astronomers. Two dedicated beacons located in Ieper (Western Belgium) and Dourbes (Southern Belgium) act as transmitters.

The main goals of this project are:

- To collect and standardise the meteor observations of all the stations.
- To write codes for **automatic detection** of underdense/overdense meteor echoes.
- To compute **meteoroid flux densities** for meteor showers and **mass indexes** for meteor showers and sporadic meteors.
- To determine **individual meteor trajectories** from observations of the same meteor by multiple stations (both shower meteors and sporadic ones)
- To determine **orbital parameters** of multi-station meteoroids
- To analyse meteor profiles in order to retrieve physical parameters such as **ionization, speed and mass** of the meteoroids
- To study **head echoes** and the so-called "**epsilon**" echoes
- To promote radio-observation of meteors.

Currently, most of the BRAMS receiving stations belong to the radioamateur network of the **VVS** with about 15 receiving stations mainly spread over the Flemish region. They listen to **the beacon located in Ieper** which emits a cw circularly polarized signal at a frequency of 49.99 MHz with a constant power of 50W.

In September 2010, we will add a second beacon in the **Geophysical Center of Dourbes** which is part of the Royal Meteorological Institute of Belgium (RMI). It will emit a cw circularly polarized signal at a frequency of 49.97 MHz with a constant power of 150W.




By the end of 2010/begin of 2011, we would like to provide all existing stations with new hardware material to listen to this new beacon. The material will be identical for each station, allowing an easier comparison of the data. We also plan to extend the network by setting up new stations, first in the South of Belgium. The following groups of amateur astronomers have already expressed their interest to host a receiving station and to join our effort:

- the **GAS** in Spa, the **SAL** in Nadrin
- the group "**Astronomie Centre Ardenne**" in Neufchateau
- the **Eurospace Center** in Redu

If you are interested to join our effort and present radio-observation of meteors to your visitors, please contact us.

One of our receiving stations will be located in the **radioastronomical site of Humain** which belongs to the Royal Observatory of Belgium (ROB). This station will have interferometric capabilities using the 5-antenna design described in Jones & Jones, Radio Science, 33, 55-65, 1998.



<http://brams.aeronomy.be>

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