

# DETECTING WHISTLERS WITH A VLF ANTENNA LOCATED IN HUMAIN (BELGIUM)

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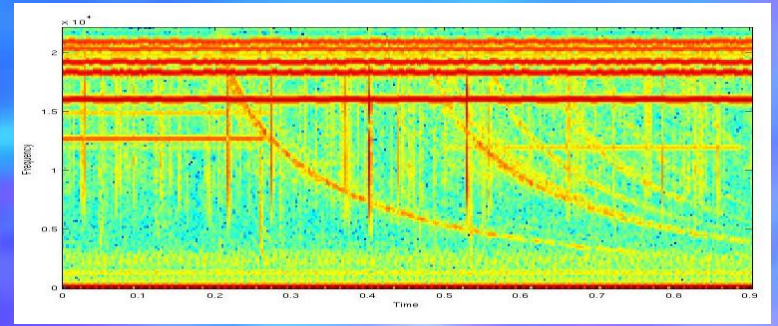
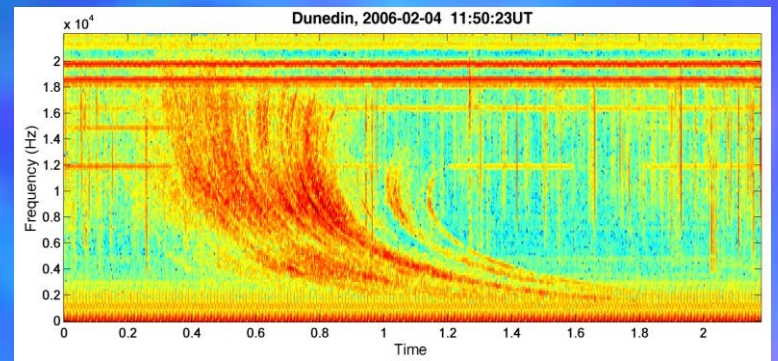
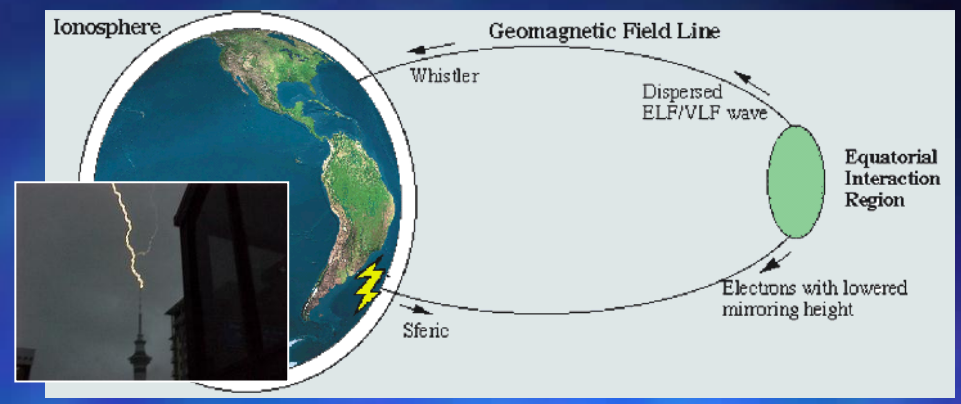
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# Whistlers

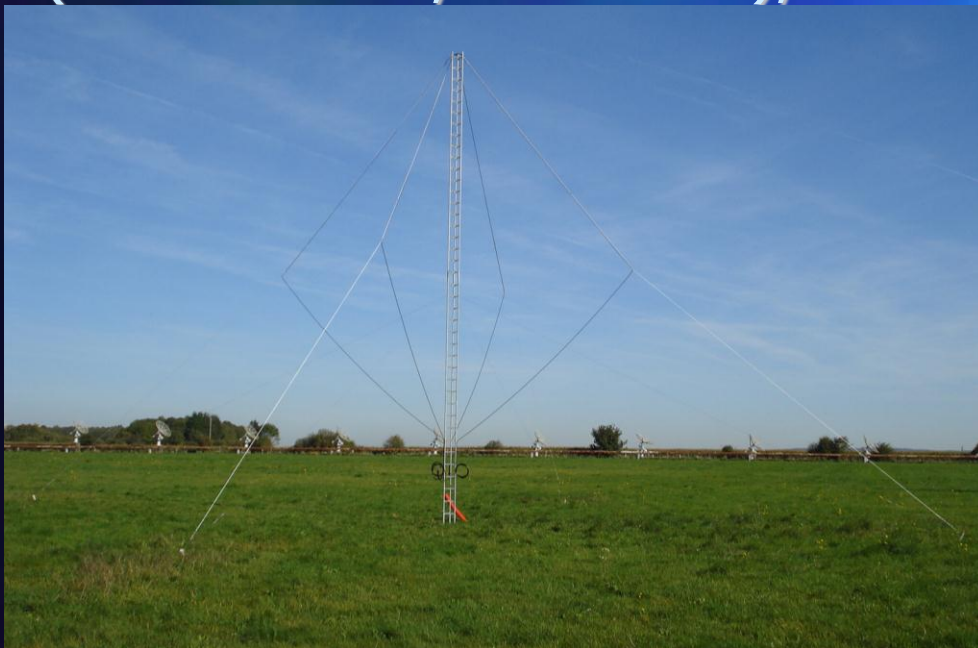


- Whistlers are VLF (3-30 kHz) emissions initiated by lightning, propagating along magnetic field lines, observed on ground and in space
- Name comes from: transposition of the signal into the audio frequency gives the impression of a whistle
- Whistlers have particular frequency-time characteristics acquired as they propagate through magnetospheric plasma
- Propagation time delay of whistlers depends on plasma density along propagation paths
  - ⇒ Possibility to derive plasma density (in plasmasphere) from whistlers measurements



# VLF Antenna in Humain

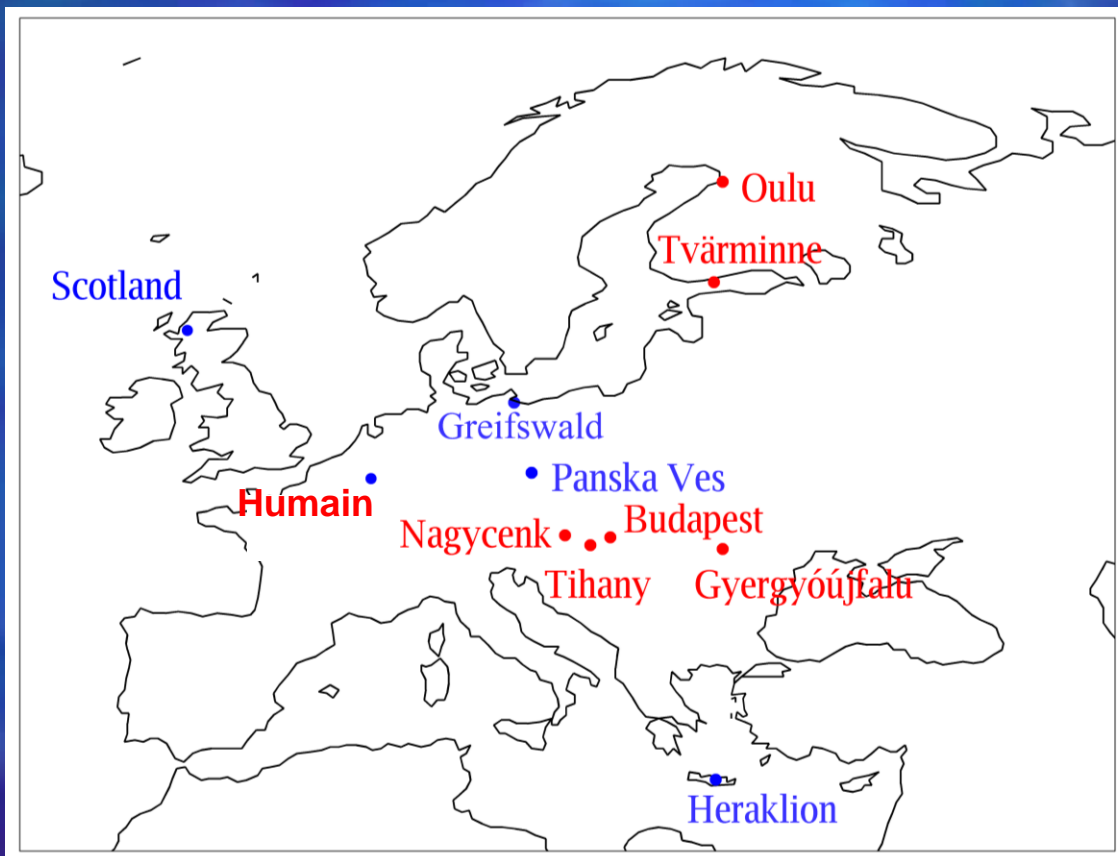
- Meet the responsible of AWDANet project in November 2009
- Selection of material, decision about size of antenna, search for location from January to October 2010
- Installation of a 12-meters mast in November 2010
- Installation of all hardware and software during Spring 2011
- VLF antenna made of 2 perpendicular magnetic loops (North-South ; East-West), area of approximately 50 m<sup>2</sup>



# AWDANet in Europe

## ■ AWDANet = Automatic Whistler Detector and Analyzer systems' Network

- Network of AWDA systems covering low-, mid- and high (magnetic) latitudes since 2002 including conjugate locations
- Network initiated by Dr. Lichtenberger from Hungary
- Same type of antennas with same data analysis software
- In Europe, 7 antennas in operations (including Humain) and 4 antennas in preparation

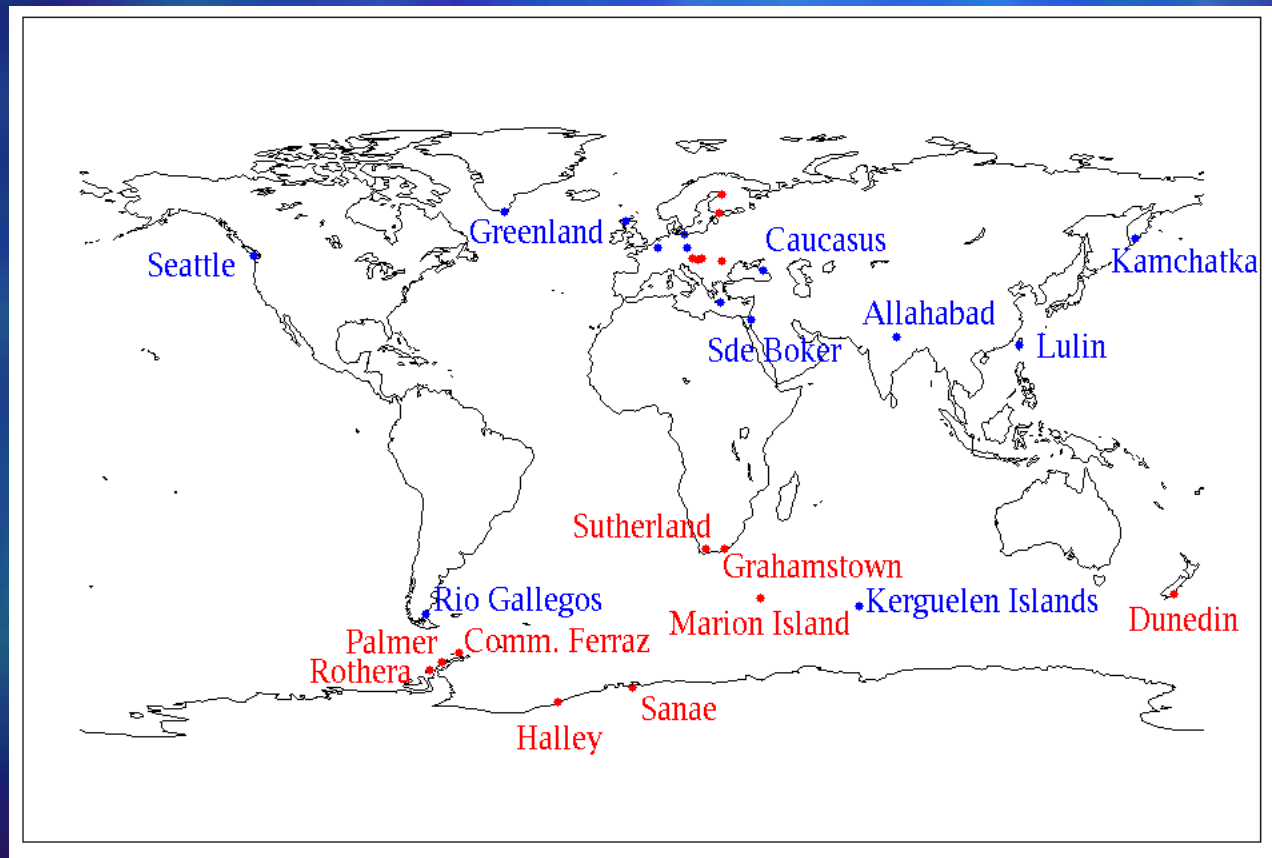


# AWDANet in the World



## AWDANet

- In World except Europe, 9 antennas **in operations** and 9 antennas **planned or in preparation**
- Particular search of locations at conjugate points of Europe antennas

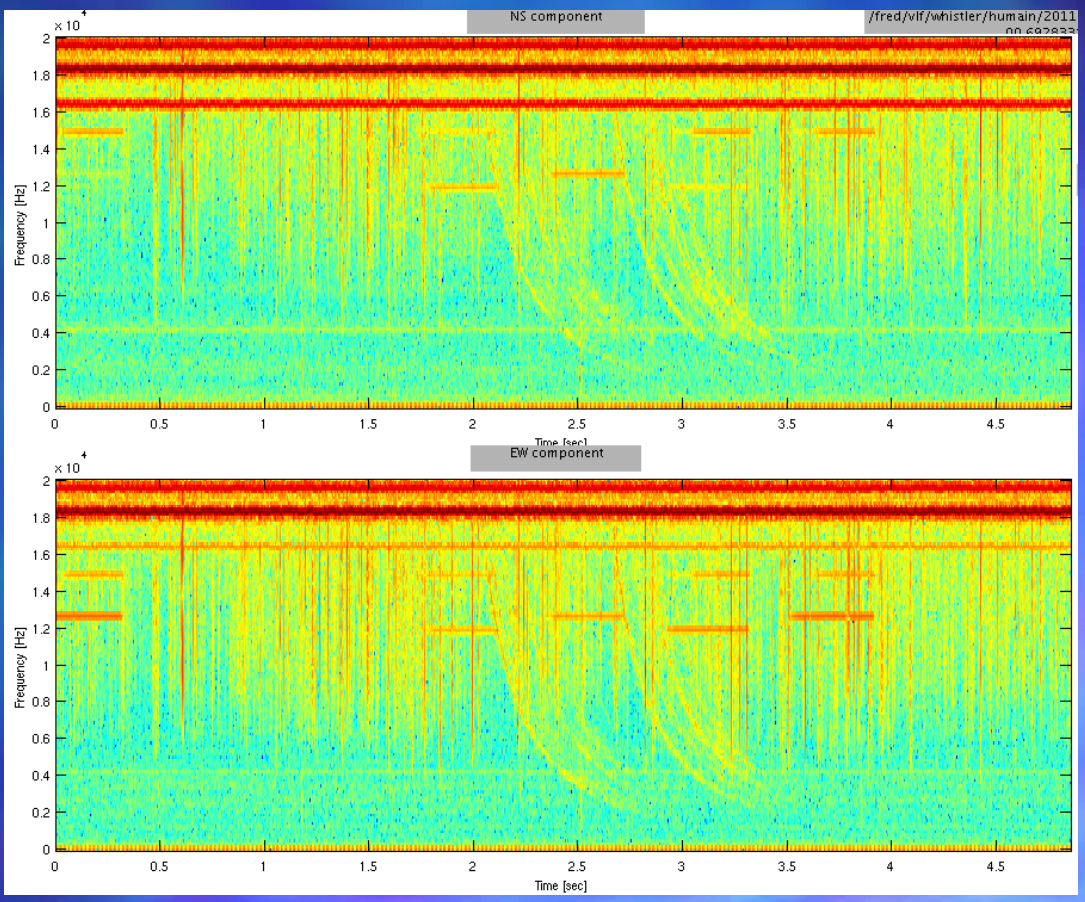


# Measurements with VLF Antenna



- First measurements with the antenna in mid-April 2011
- 1 week of data:
  - 1340 output files
  - 940 files with whistlers
  - Good quality of data

- Frequency-time spectrograms
  - 0-20 kHz ; 5 seconds
  - Top: North-South ; Bottom: East-West



# Future

- Solve hardware problems (shut down of the computer)
- Continue automatic whistlers detection
- Derive plasma density from whistlers observations
- Start statistical analysis
- Present first results at IUGG-IAGA conference in July 2011
- Start compared studies with other antennas
- Start conjugated analysis with in-situ measurements of plasma density in plasmasphere (Cluster)
- Start comparison with density data obtained from numerical simulations
- ...

