Ground based and satellite observations of the Ionospheric Alfven Resonance

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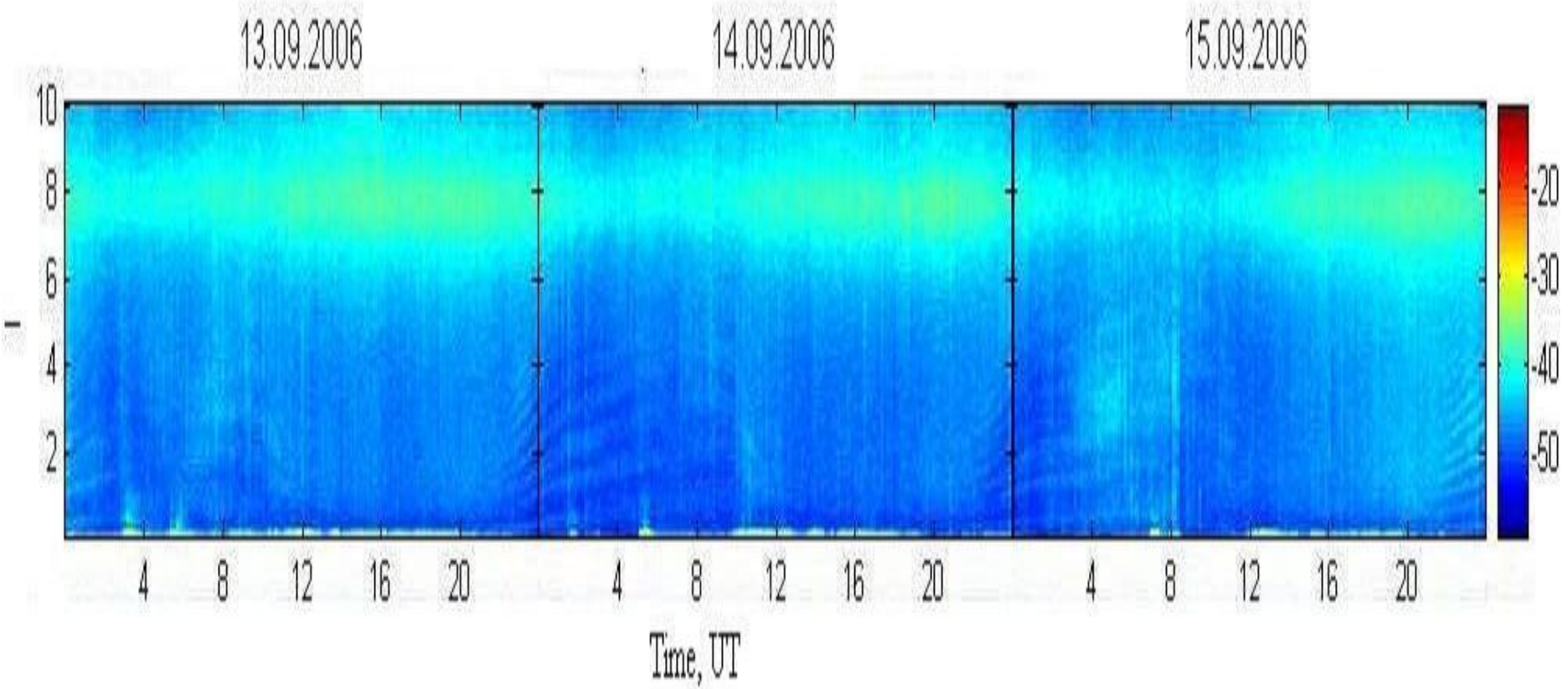
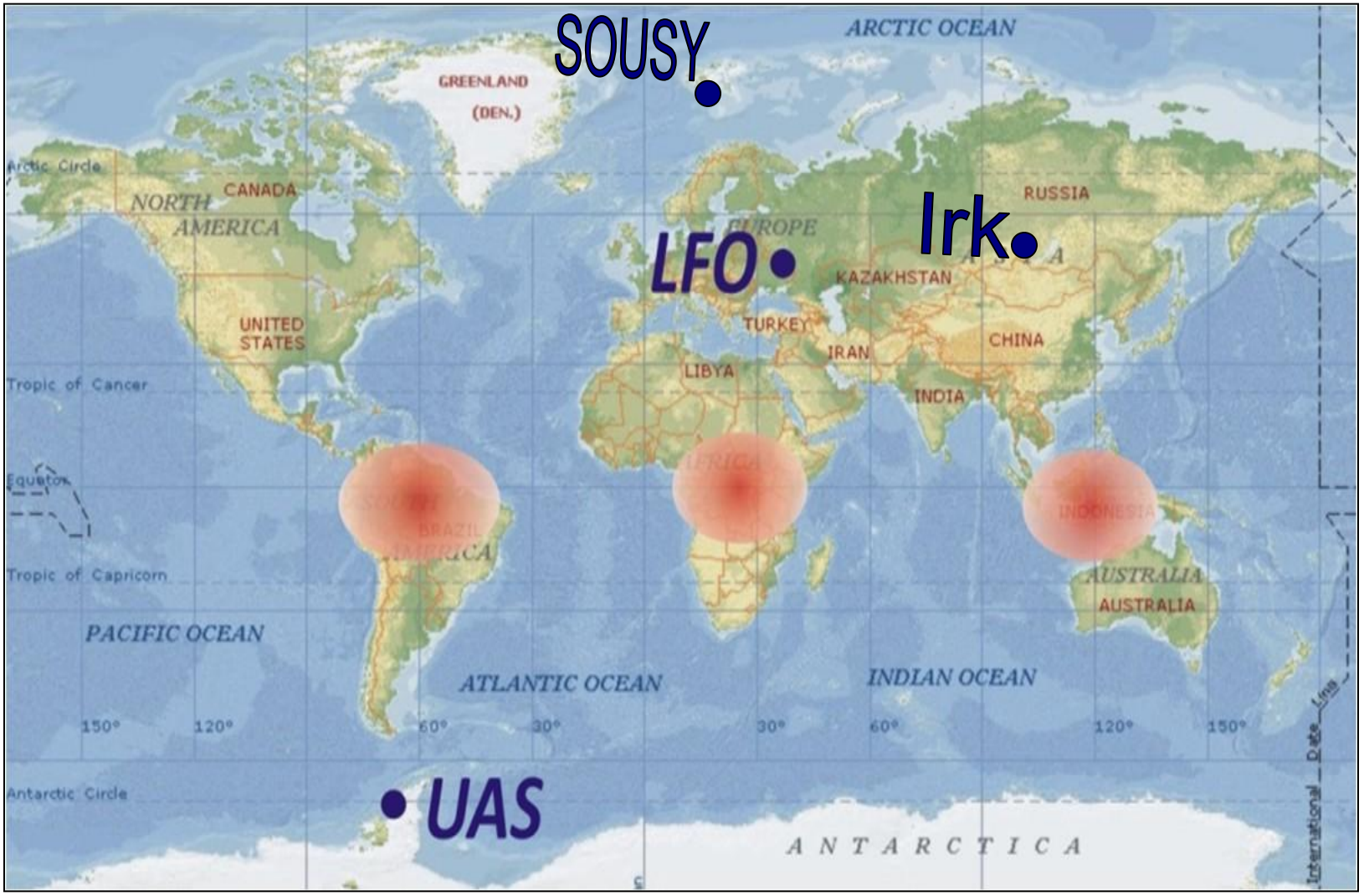
Sample of the Spectral Resonance Structure of the Ionospheric Alfven Resonance



Stations of observation



Equipment

- UAS
- SOUSY

  Magnetometer Lemi112

  Frequency range 0.001 – 80 Hz

- Sayan Solar Observatory

  Magnetometer Lemi30

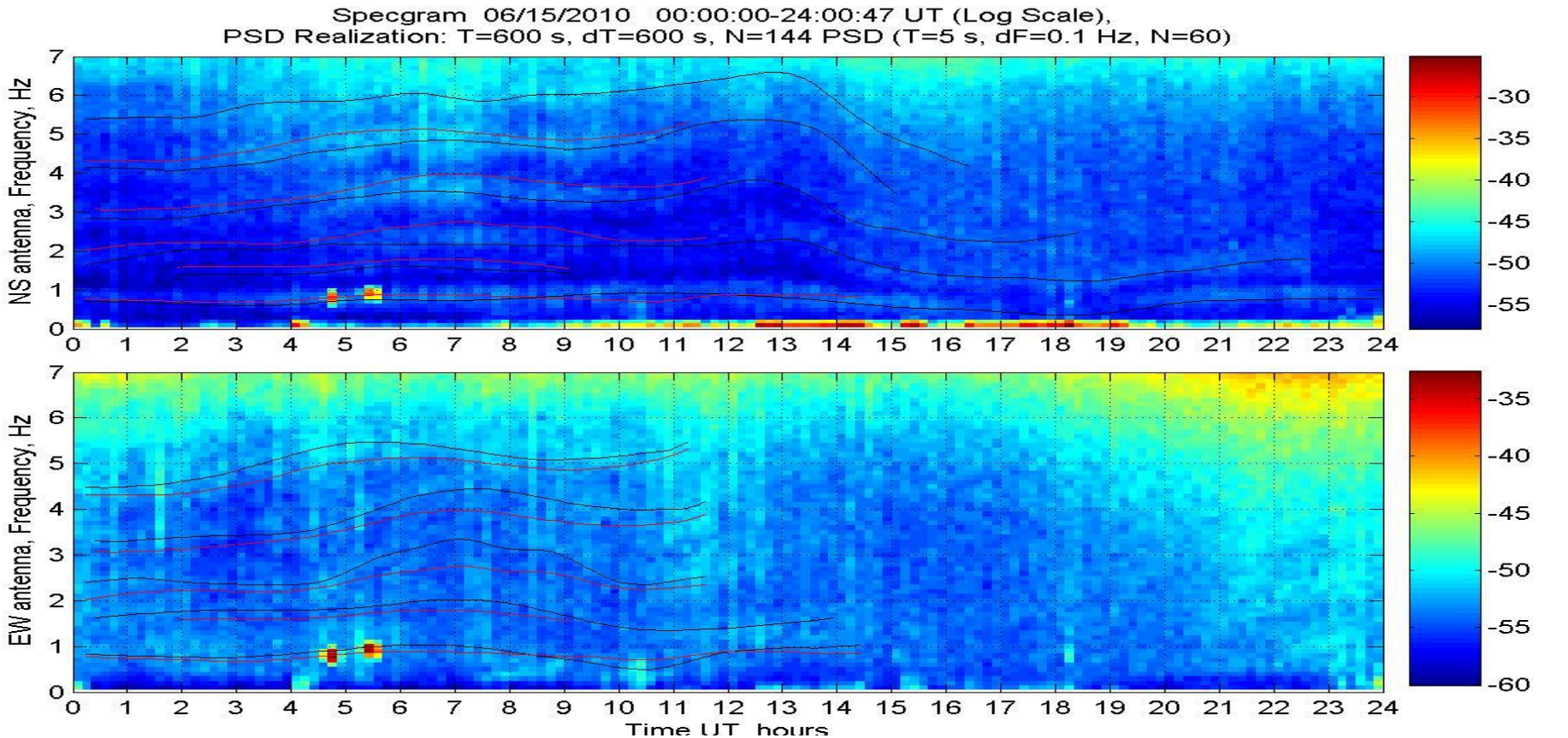
  Frequency range 0.001 - 40 Hz

- Lviv Centre of Institute for Space Research NASU NSAU http://isr.lviv.ua

- LFO IRA NASU (http://ri.kharkov.ua/geospace/en/observatory/elf.html)

Frequency range	0.5 - 40 Hz
Sampling rate	125 Hz
Retransmitter frequency	433 MHz
Retransmitter power	1 mW
Retransmitter range	≈ 3 km
Supply voltage (Autonomous part)	6 V

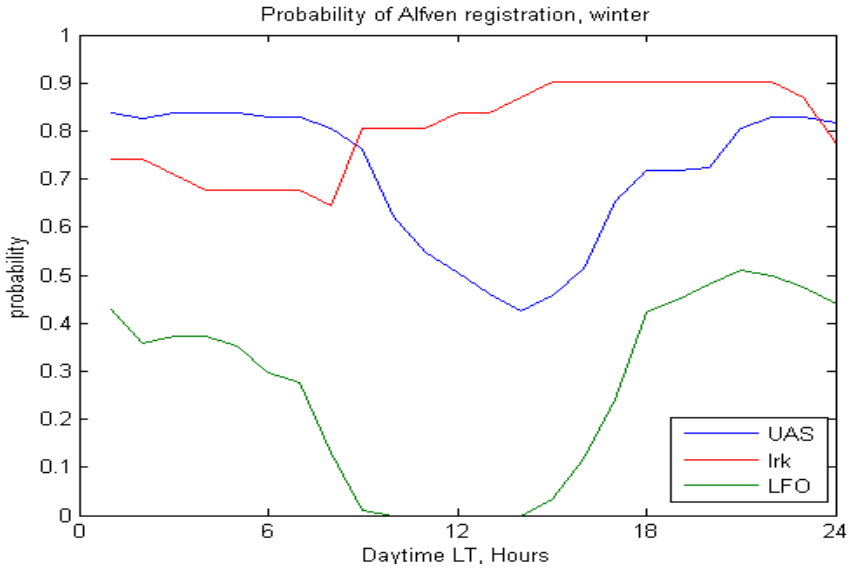
IAR Processing technique

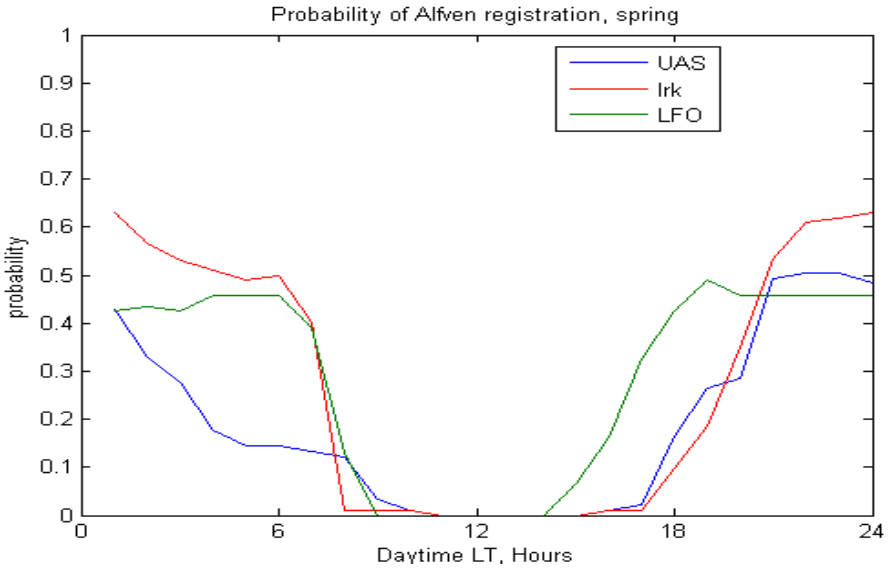


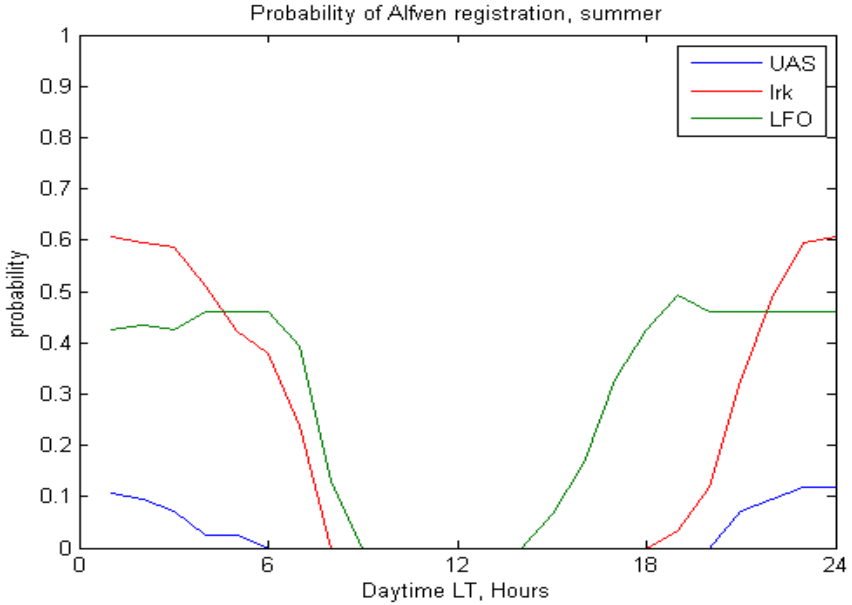
Recovered characteristics of IAR

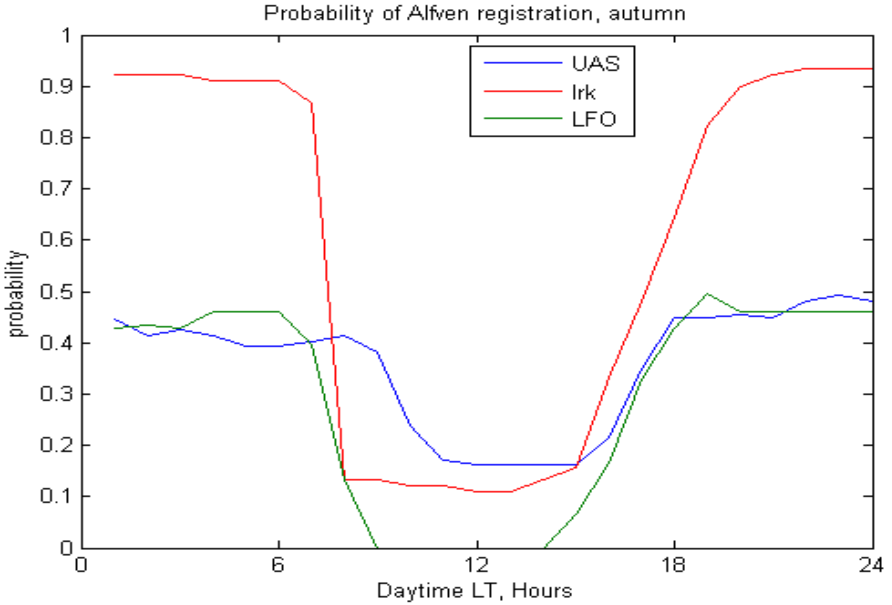
- Probability of registration;
- Frequency spacing of RSS maximums dF

Seasonal-diurnal dependencies of probability of IAR registration

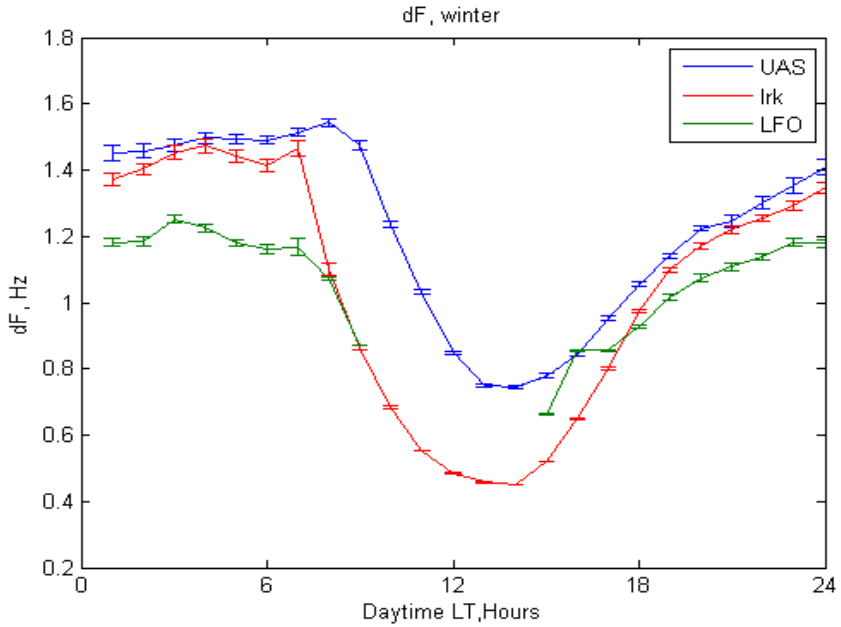


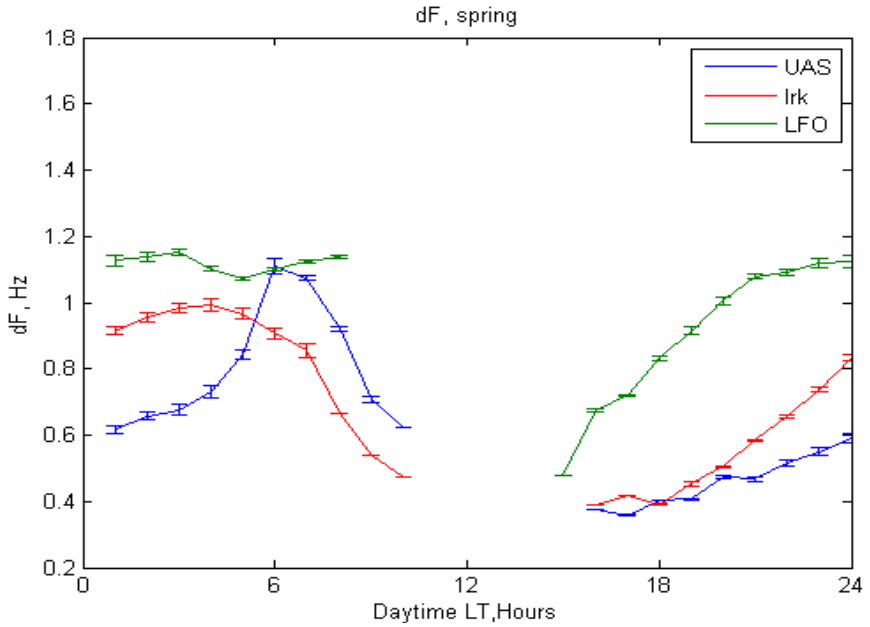


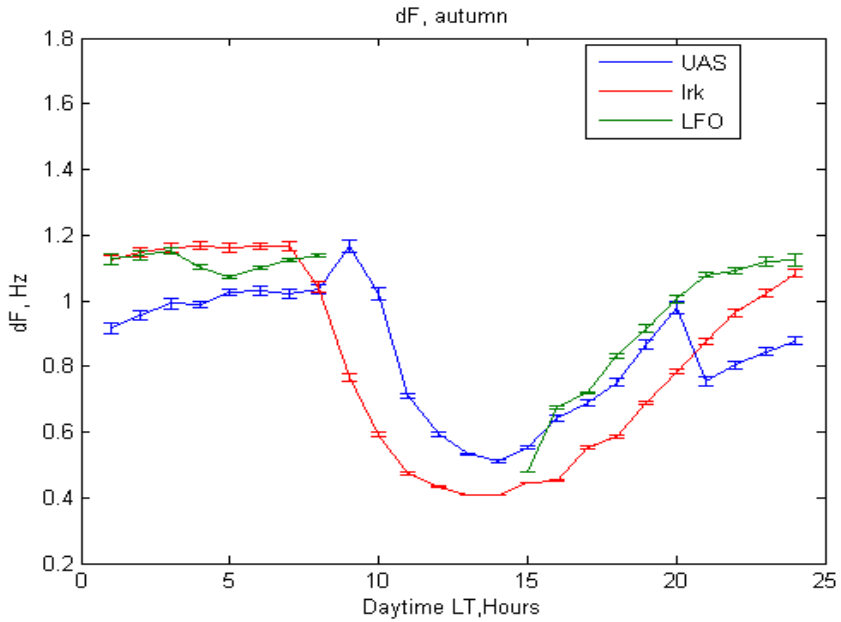


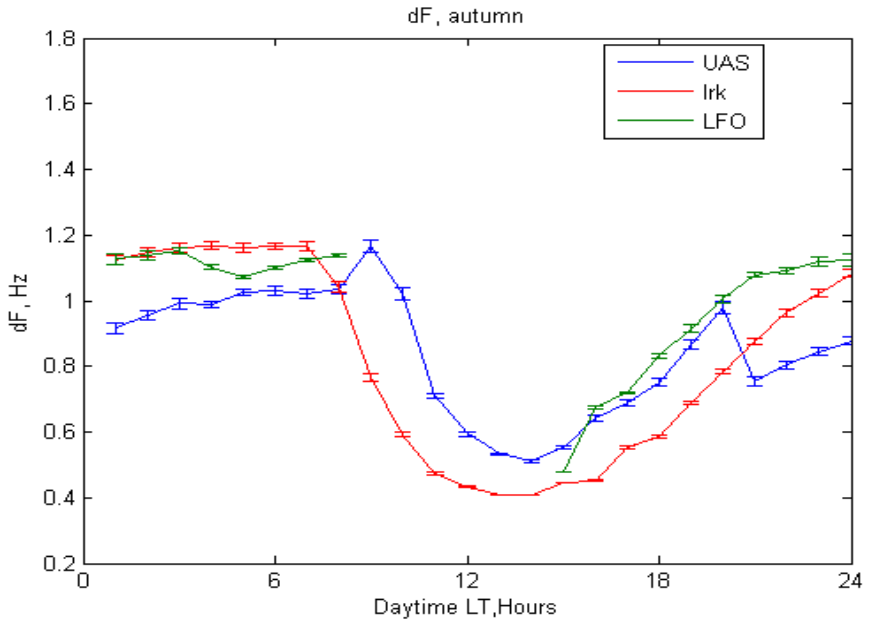


Seasonal-diurnal dependencies of dF

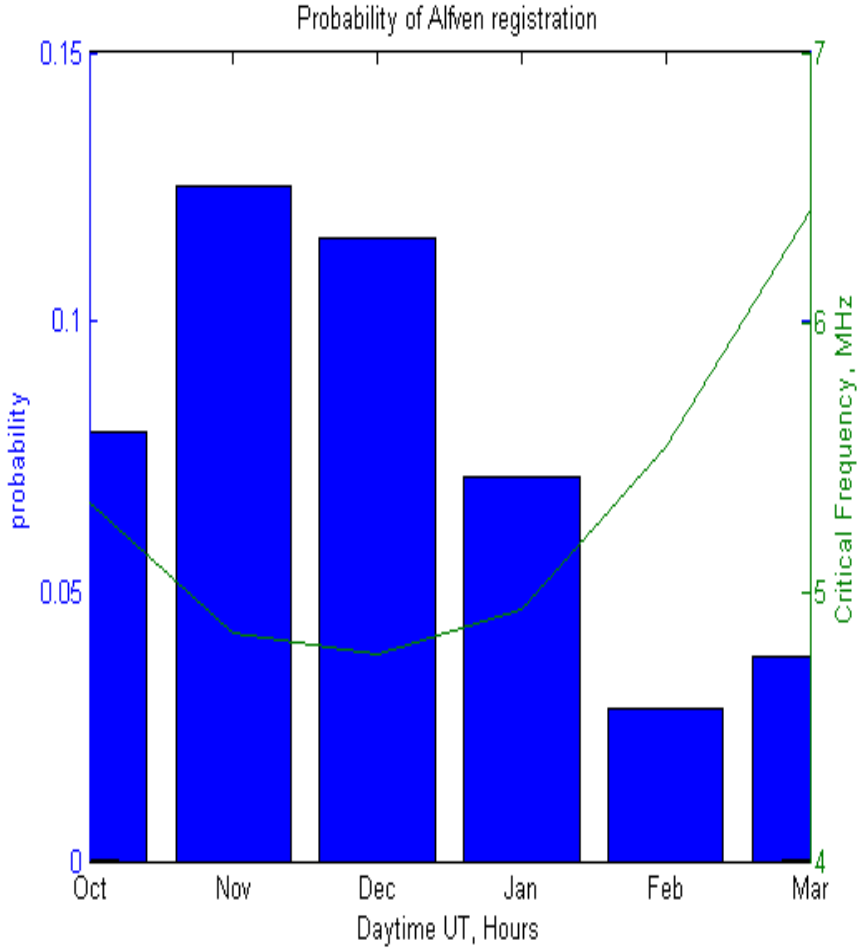


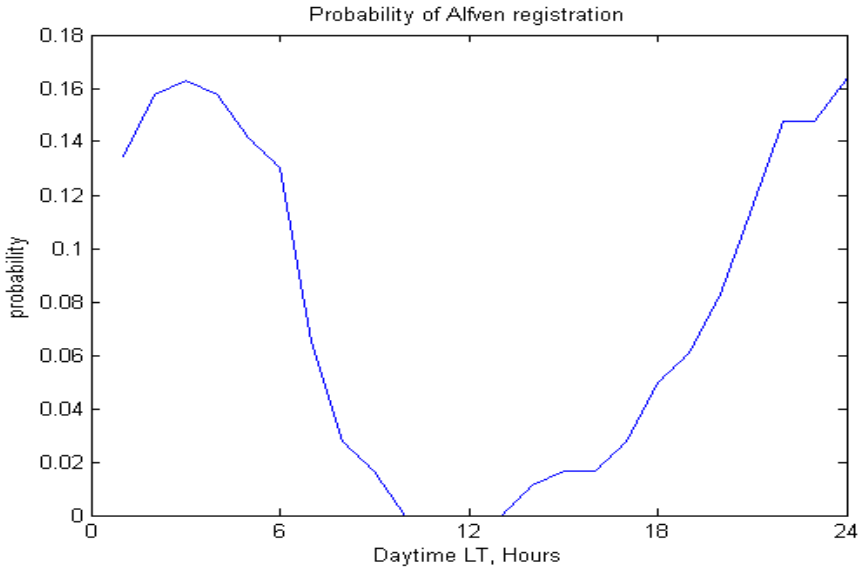




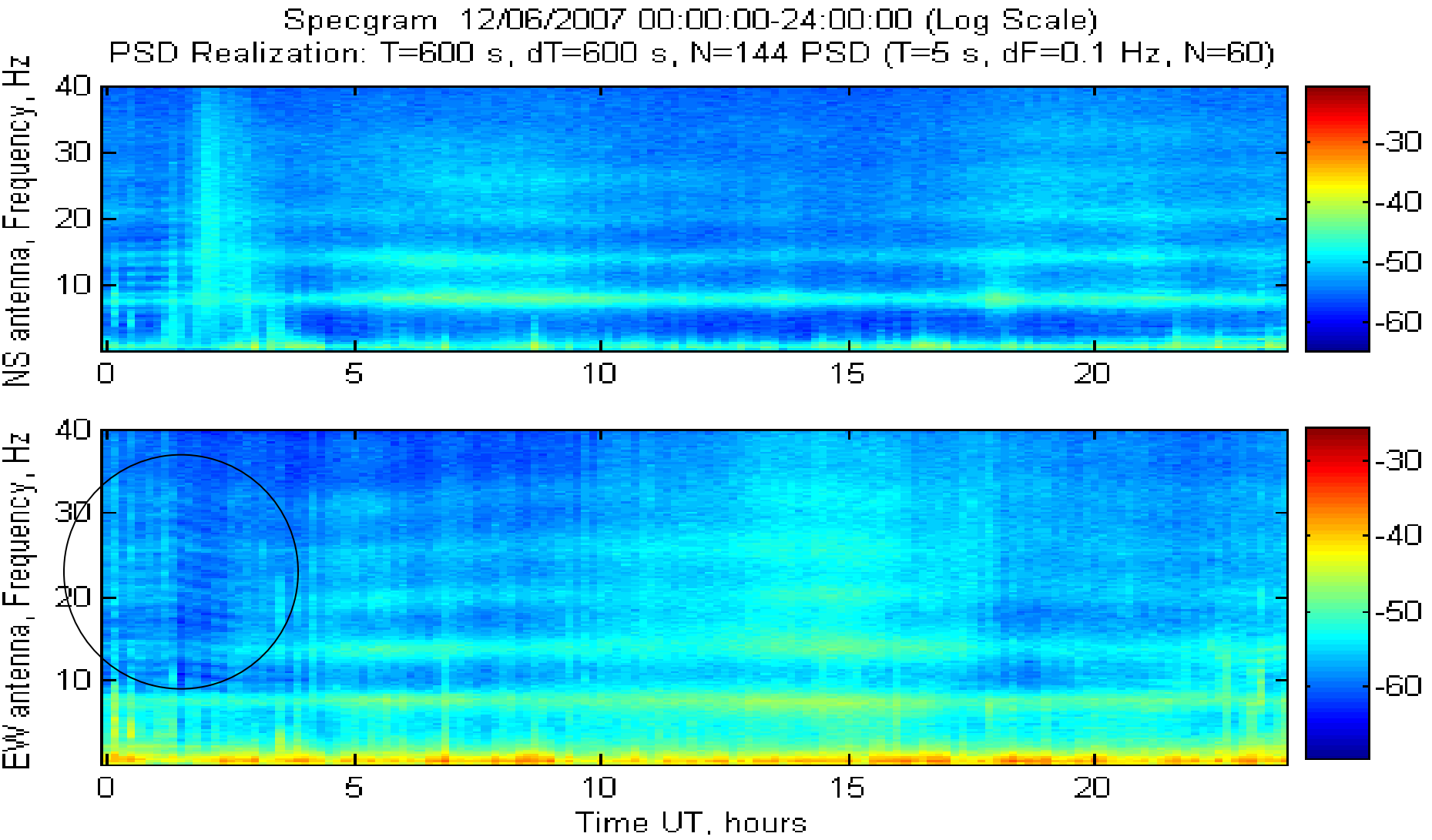


IAR data at SOUSY

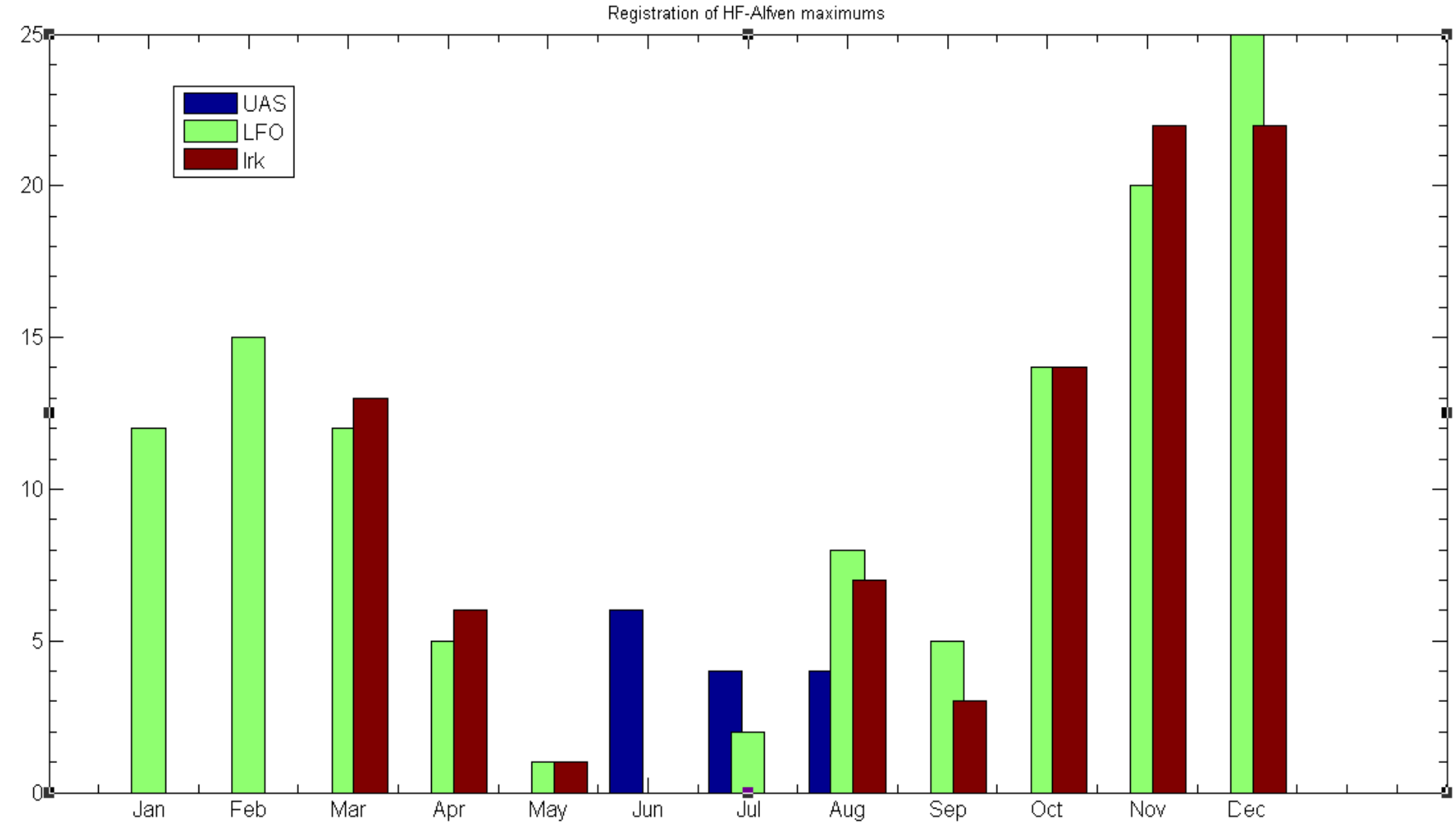




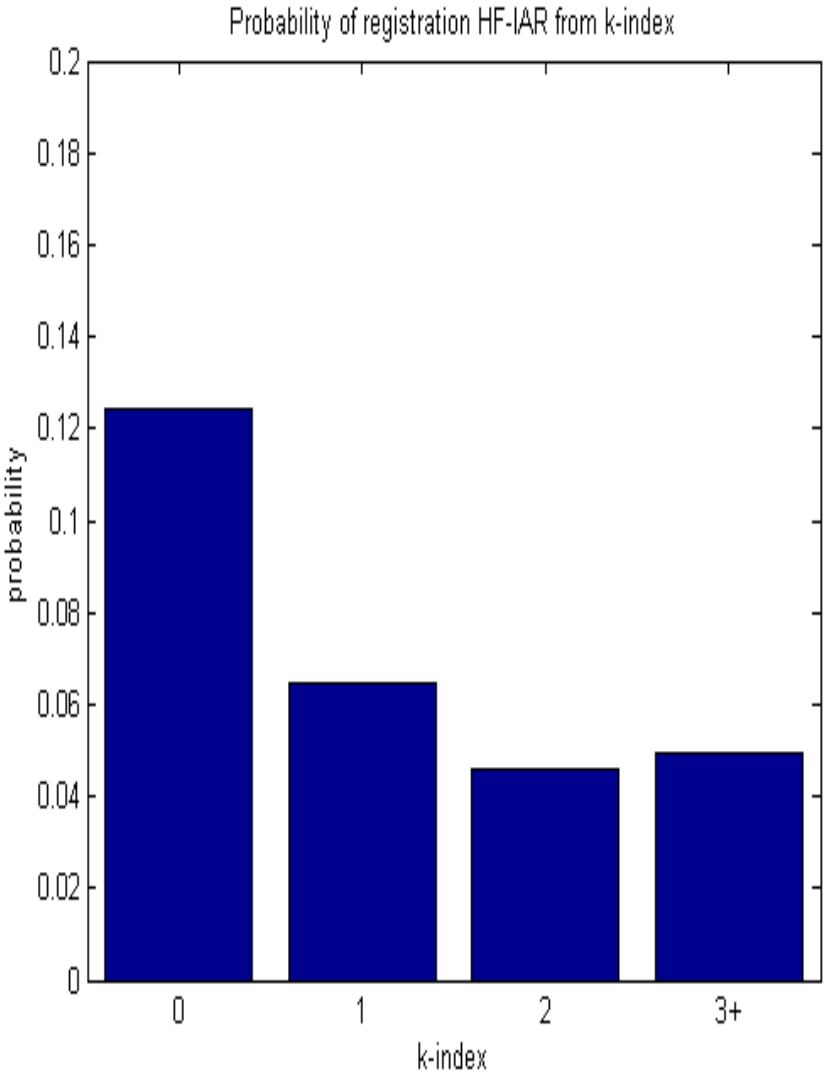
Sample of registration of IAR maximums at the frequencies higher then 10Hz

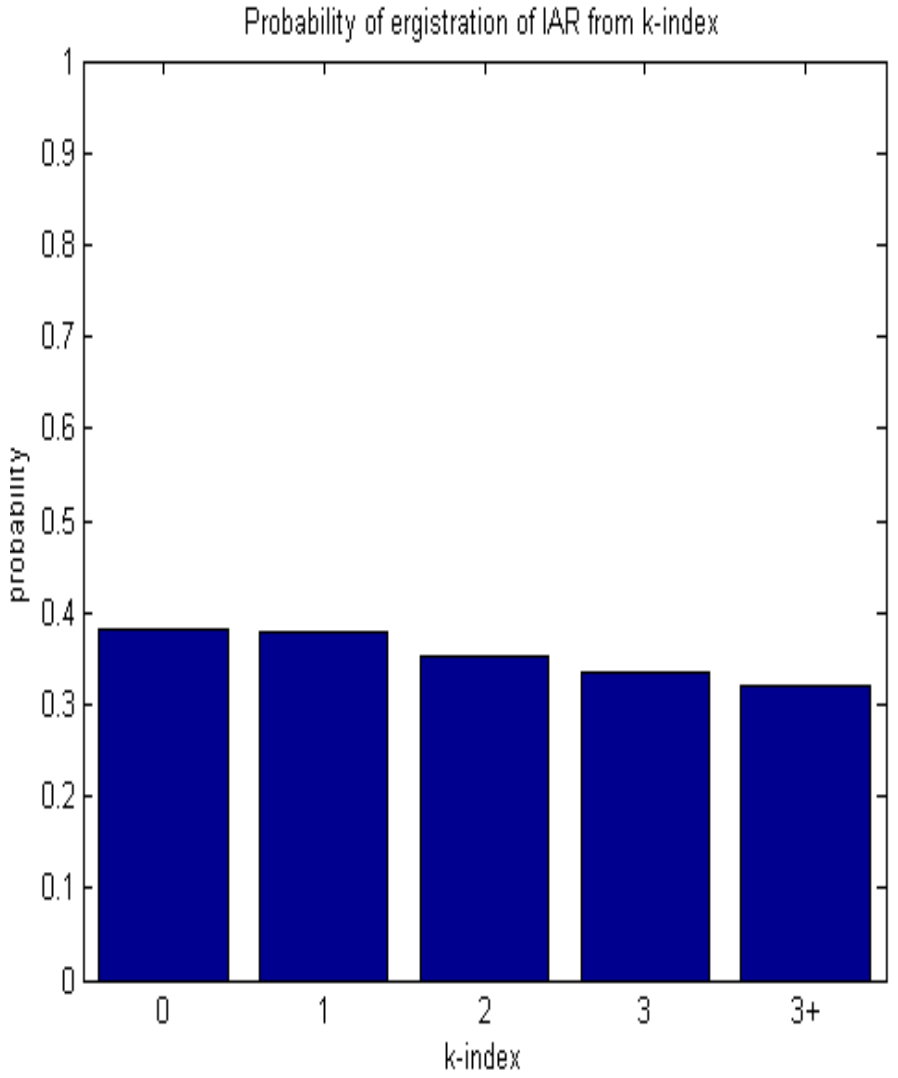


Statistic of registration of HF-IAR at different stations

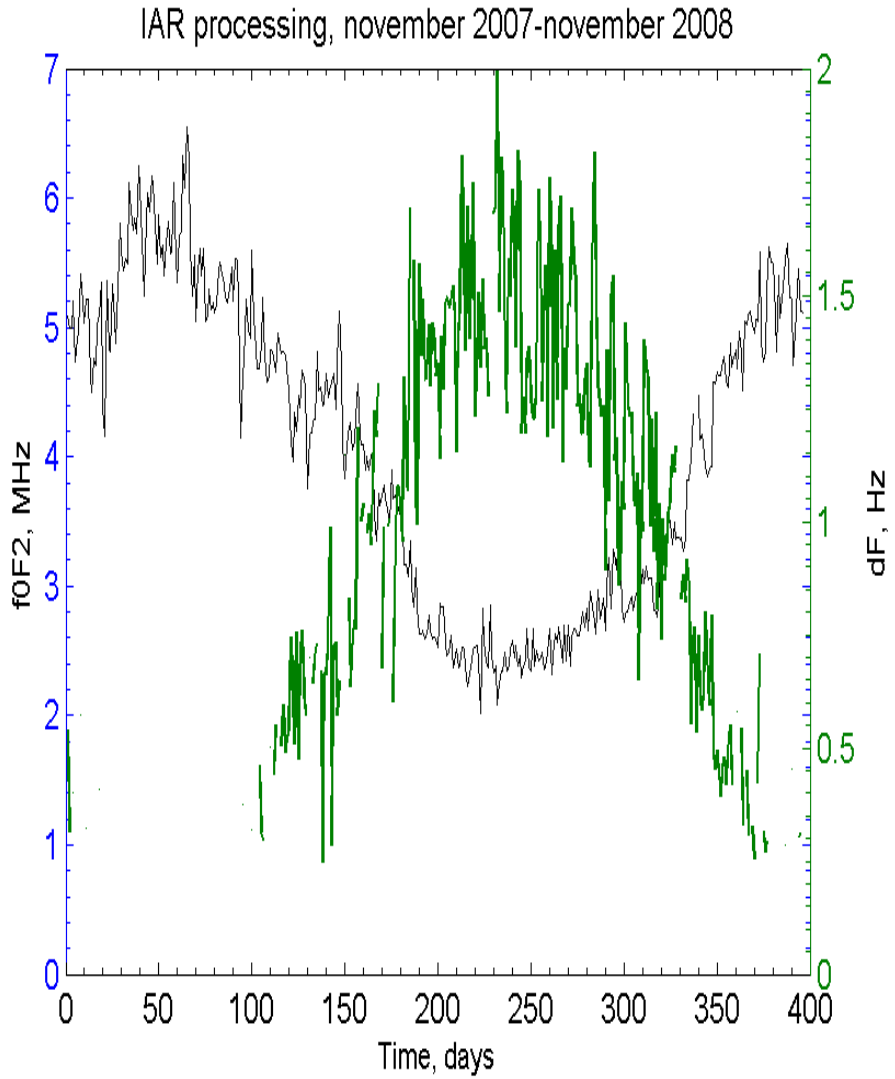


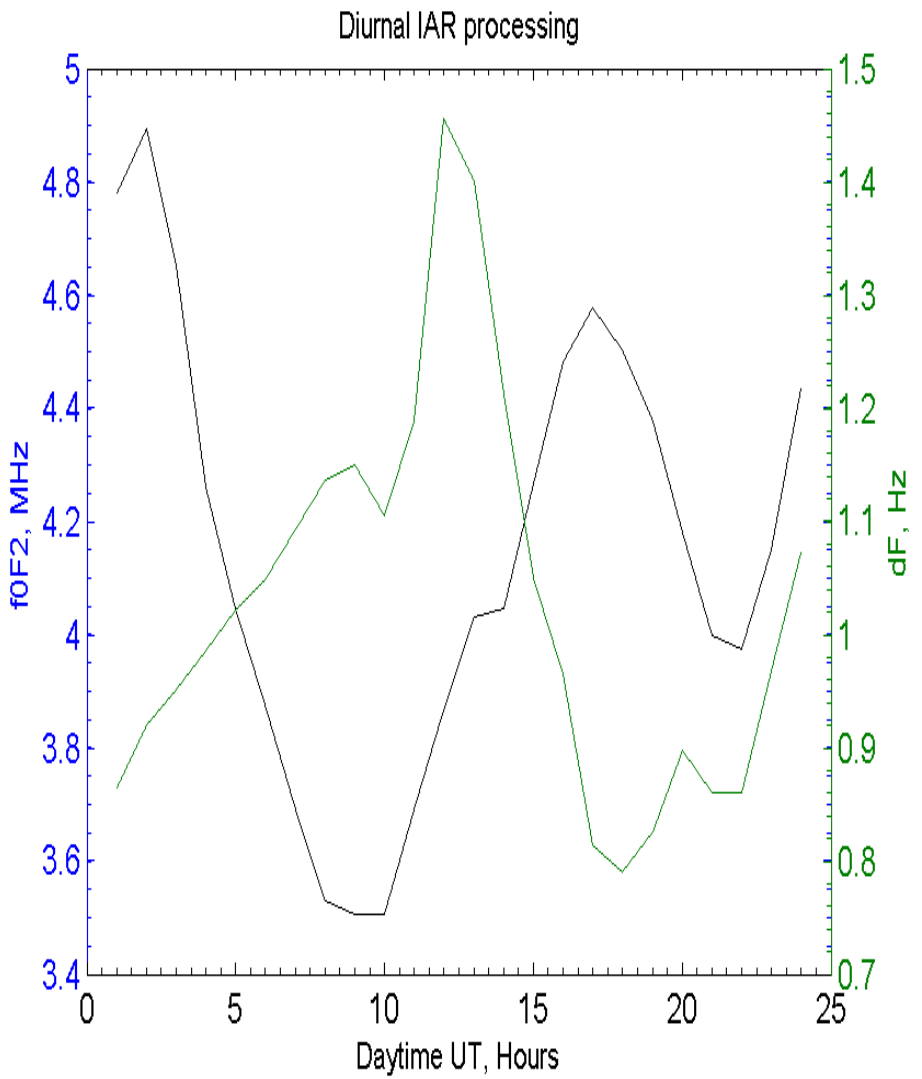
Relation between magnetic activity and probability of IAR registration



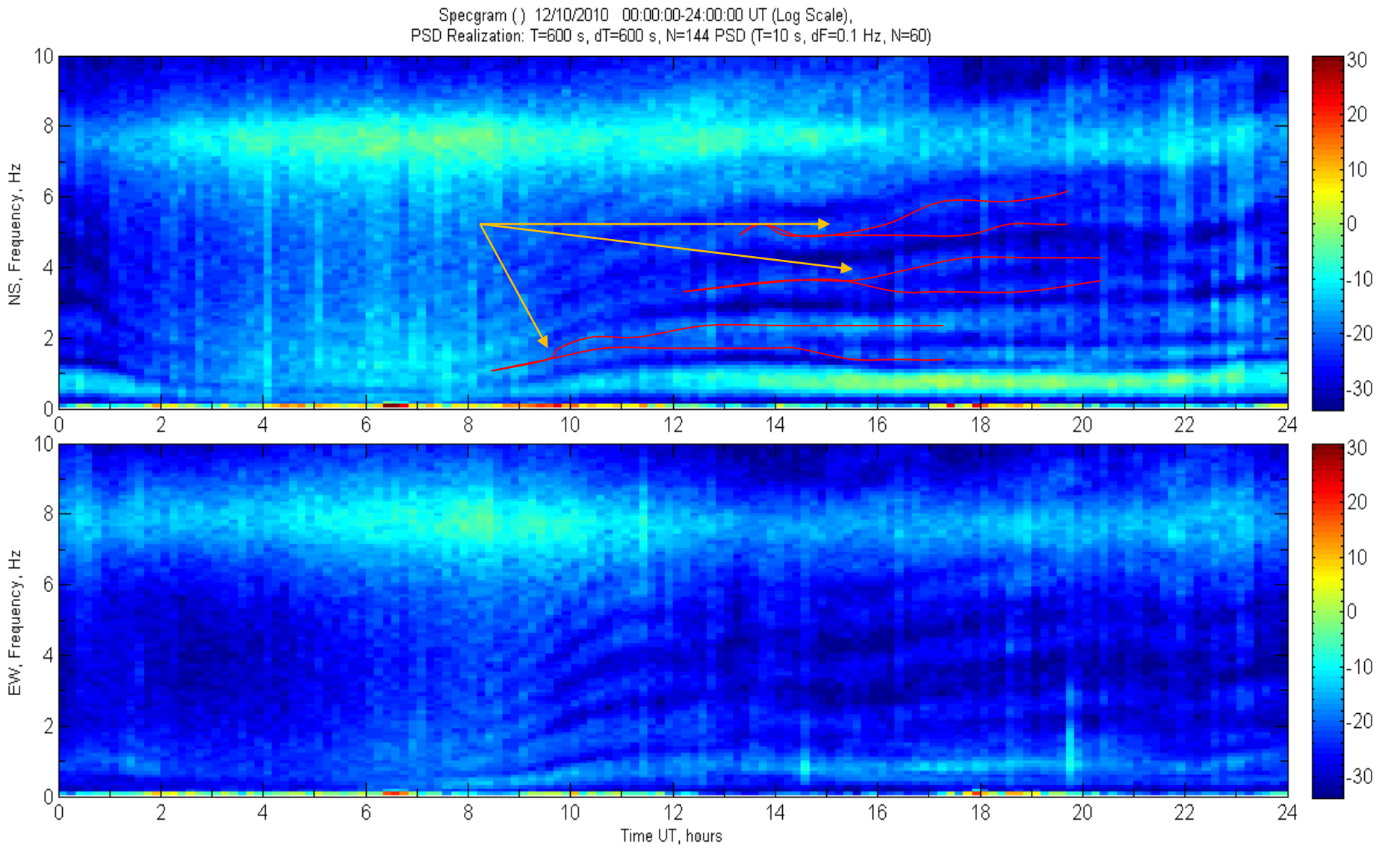


IAR frequency spacing and critical frequency

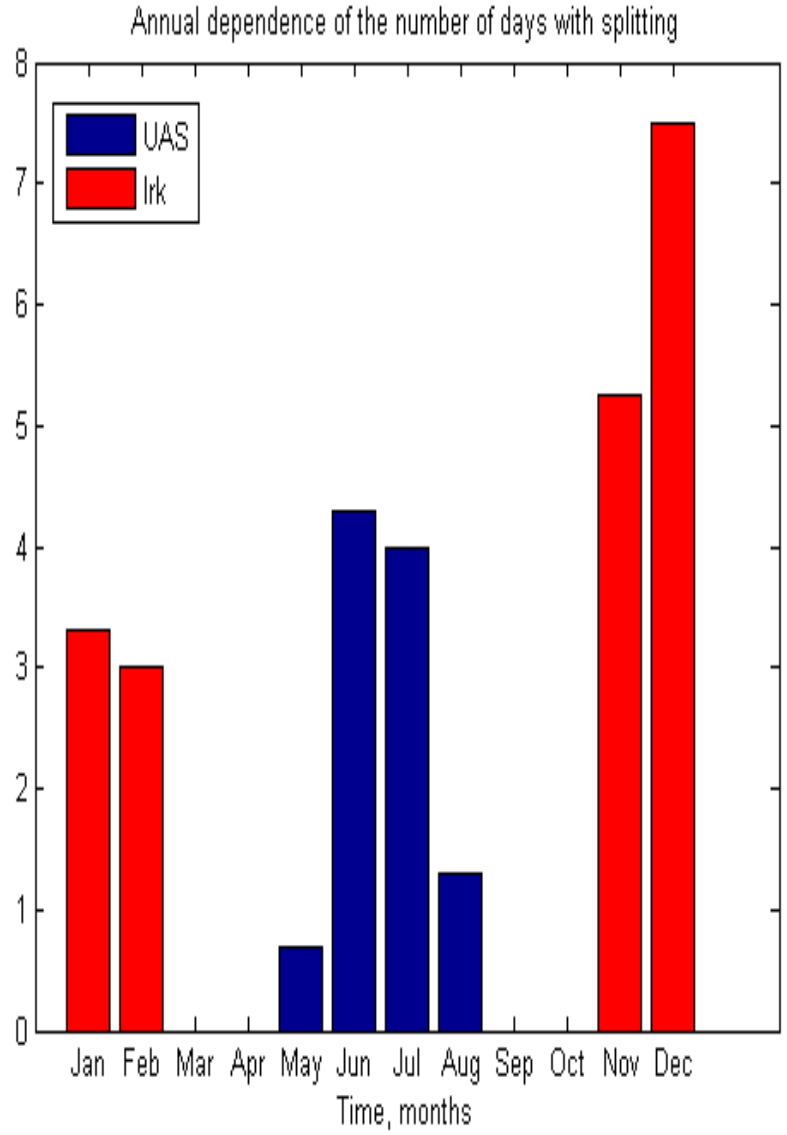


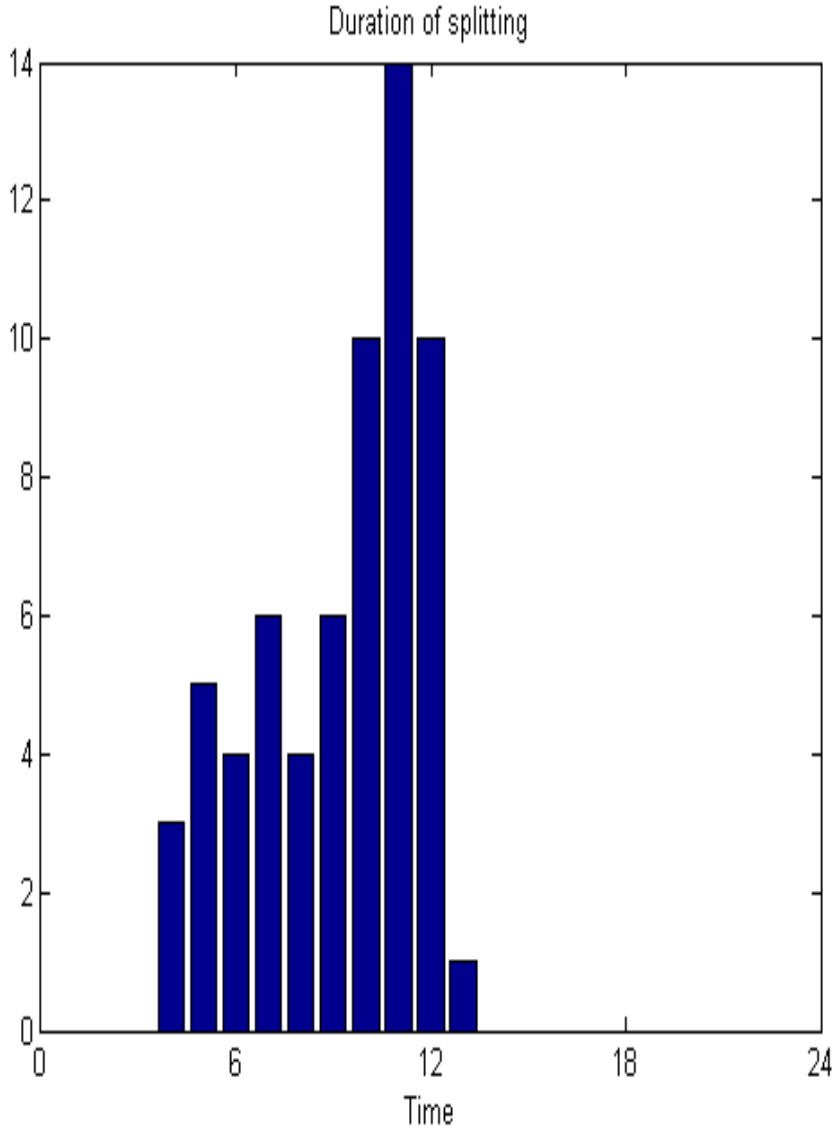


Splitting of the IAR maximums



Time dependences





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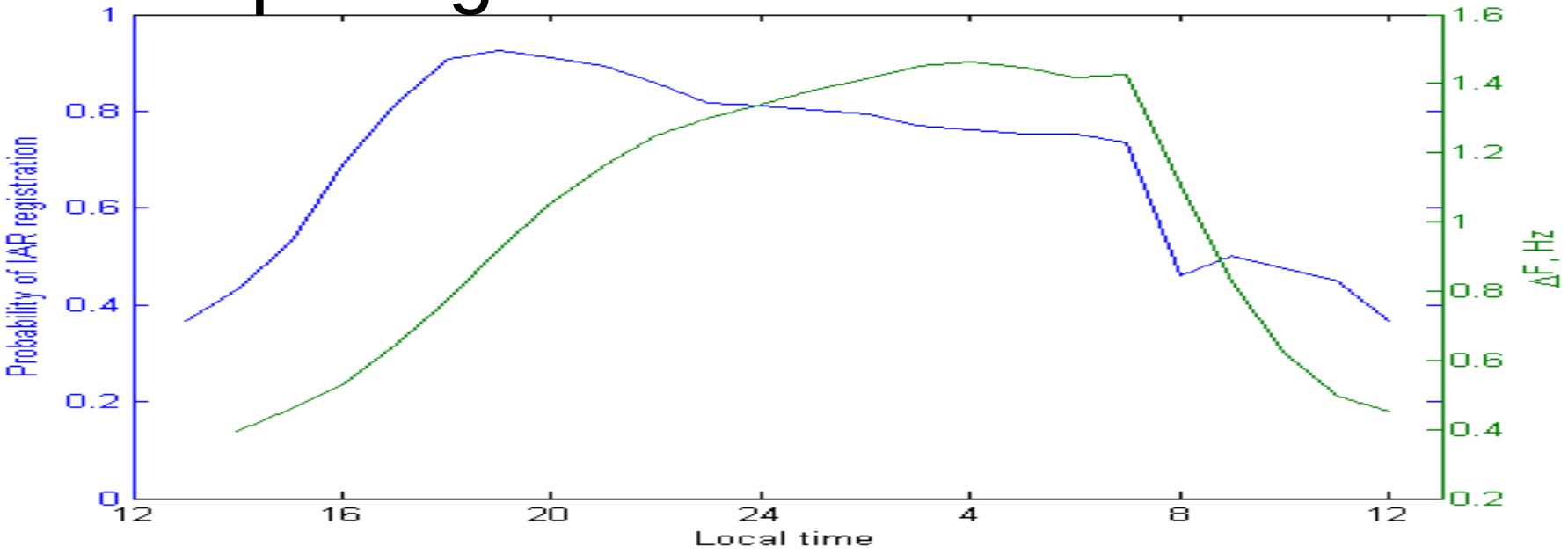
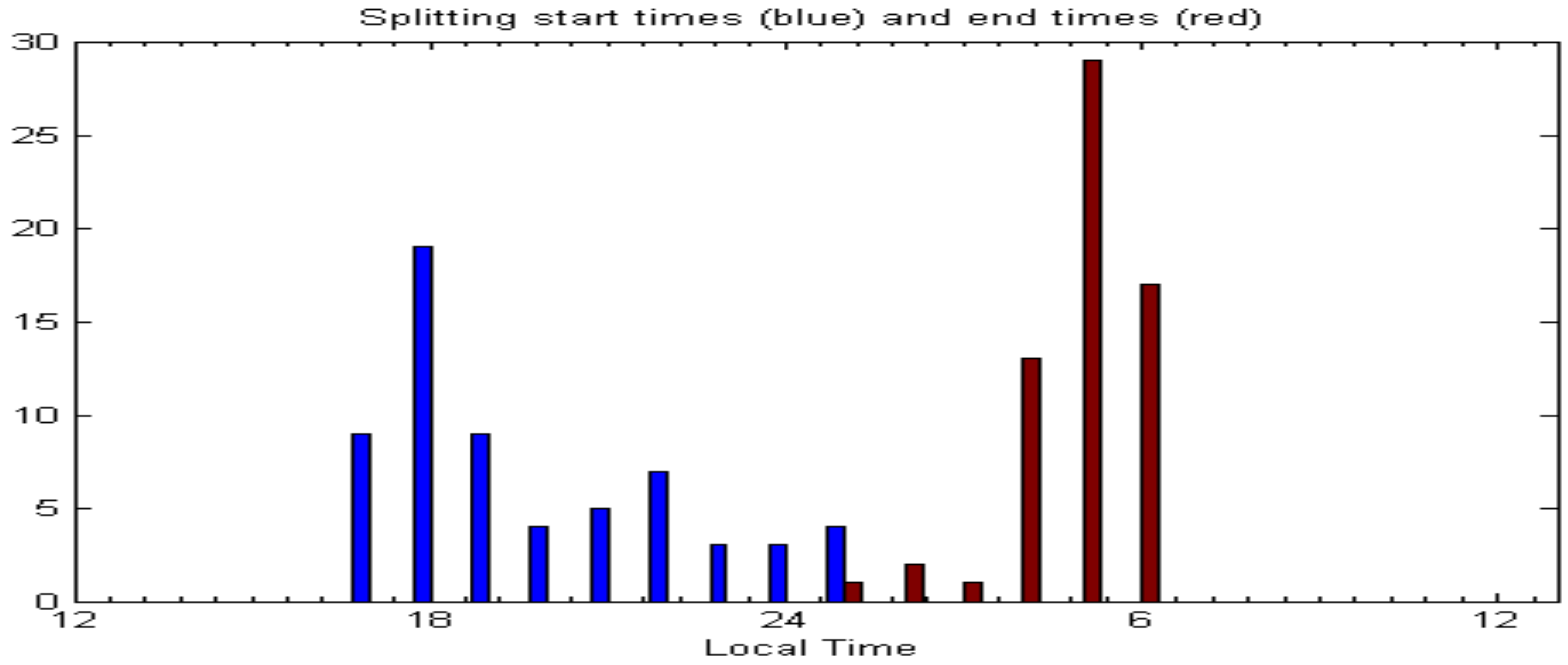
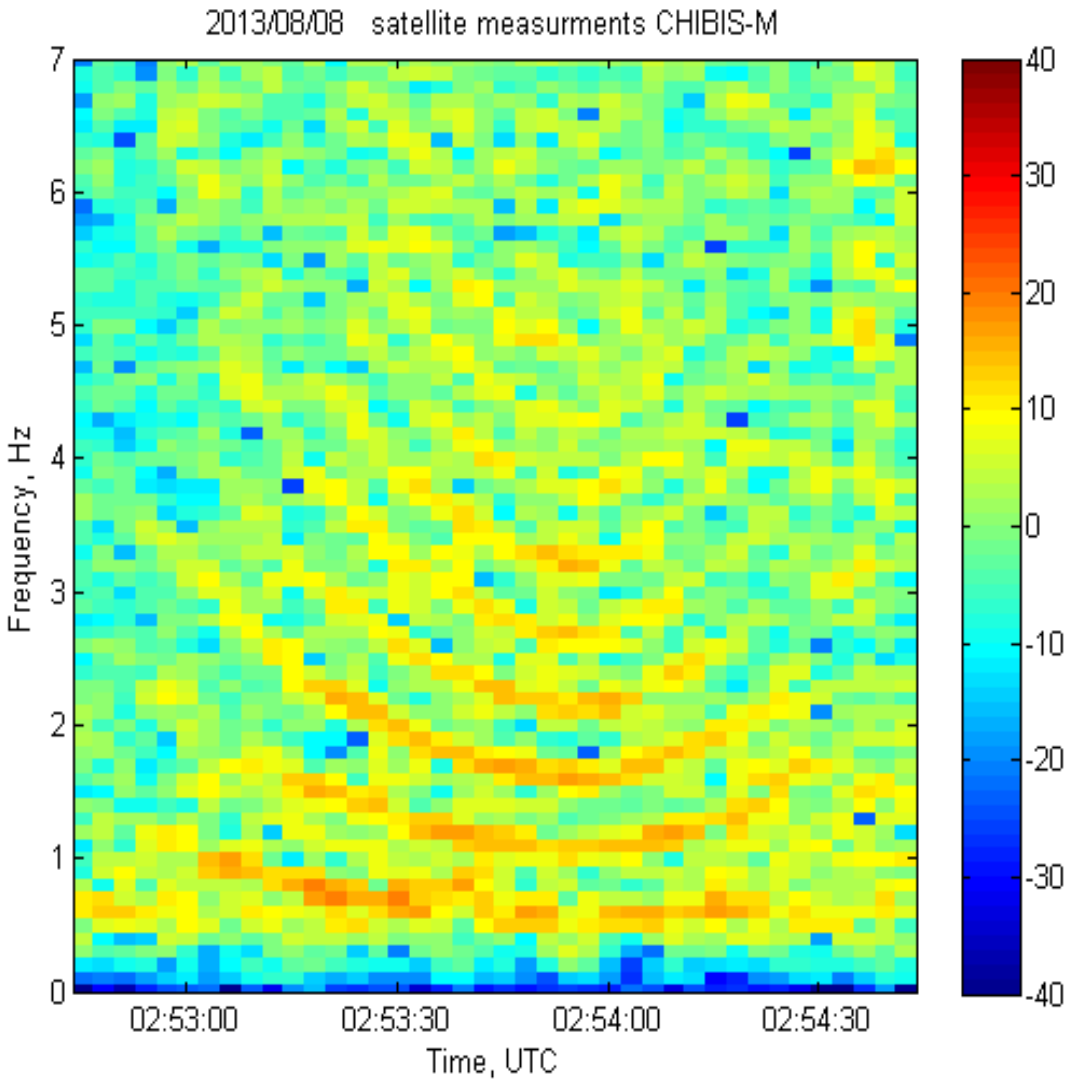




Satellite Chibis-M

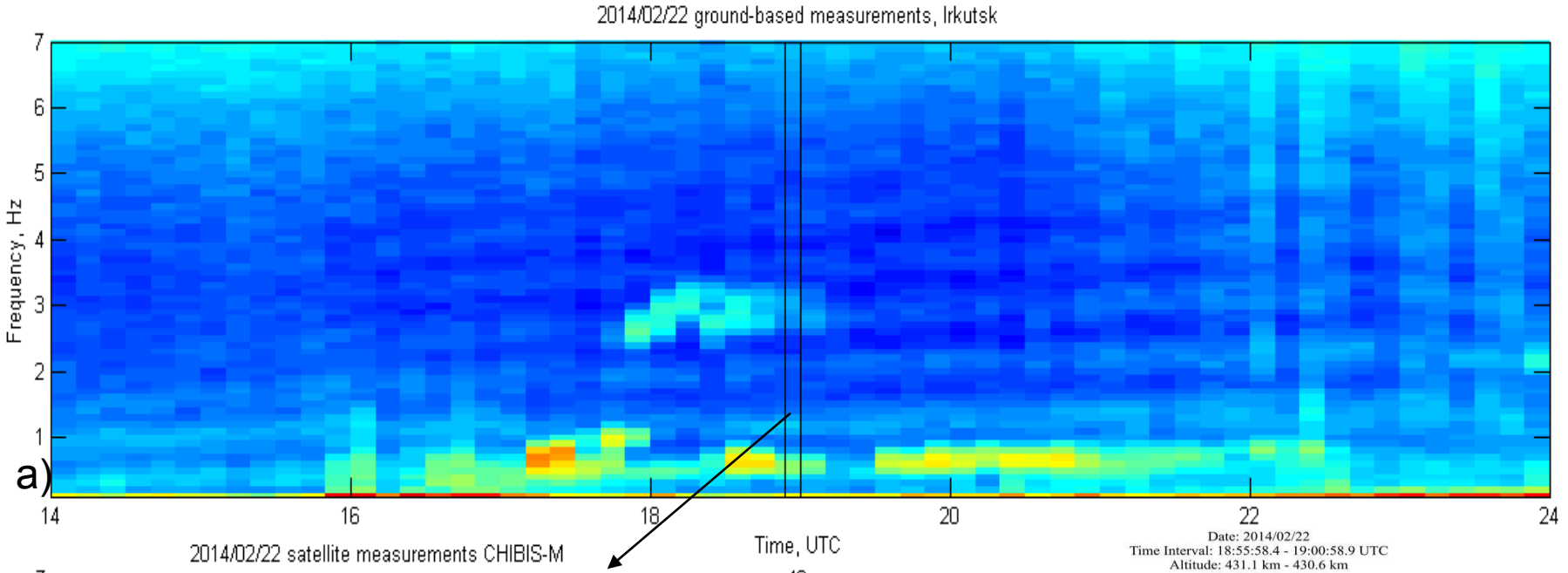
Frequency range for all channels	0.1 - 40 Hz
Dynamic range	120 dB
Noise level of measuring channels at 1 kHz	- Electric current density channel: ≤ 10-13 A/cm-2 Hz-1/2 - Electrical potential channel: ≤ 10-6 V Hz-1/2
Current density transformation factor	77 V/mA/cm2
Magnetic induction transformation factor	100 mV/nT
Power consumption	< 0.25 W

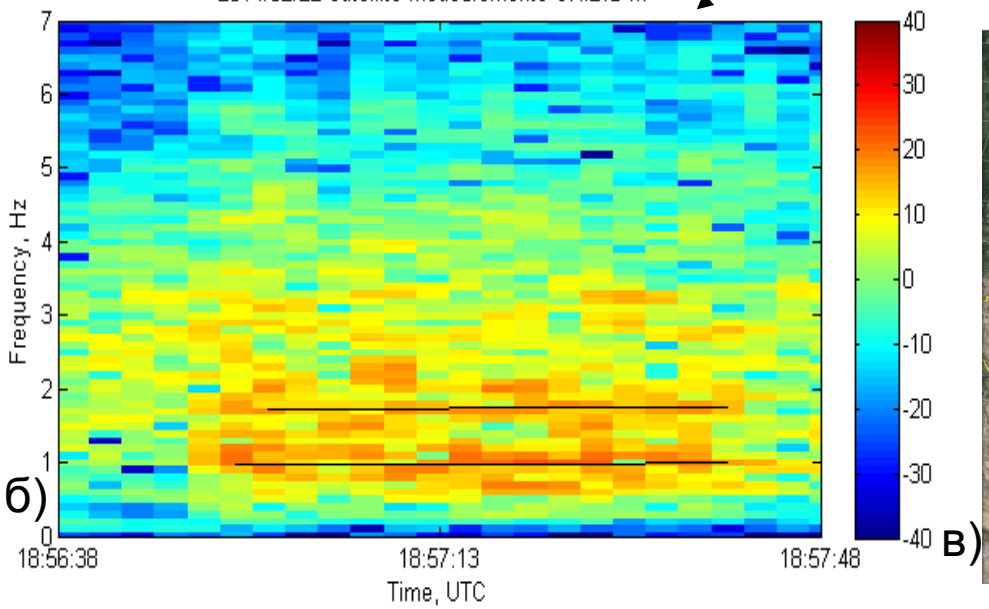


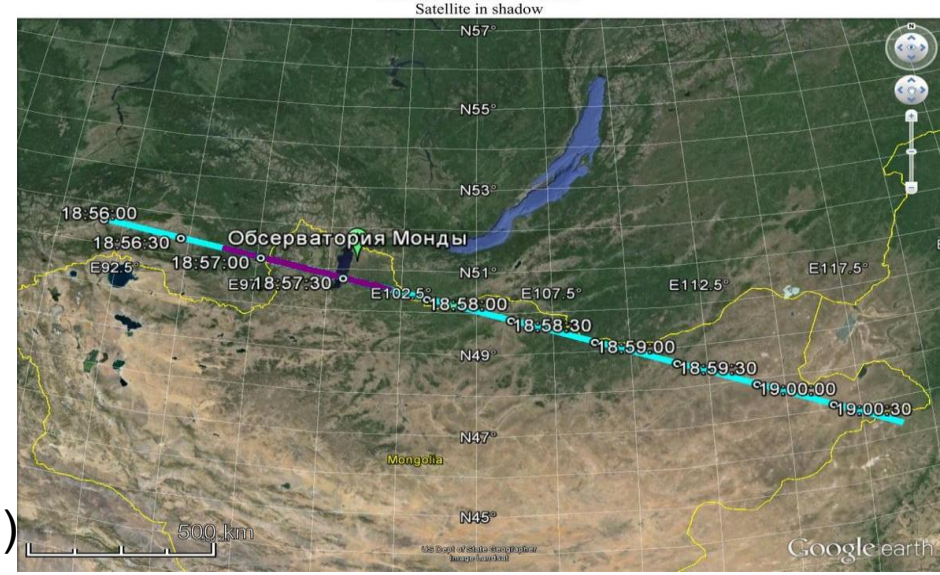
*D.Dudkin et all. Electric field signatures of the IAR and Shumann resonance in the upper ionosphere detected by Chibis -M microsatellite. JASTP 117 (2014)

Ground based and satellite measurements

ΔF=0.76 Hz







Conclusions:

- Diurnal and seasonal dependences of the IAR characteristics were recovered for the stations of observation spaced far away. We made comparative analysis of their morphology.
- SRS at frequencies up to 40 Hz were detected. We showed that in 80% of time such effect was observed not synchronous at different stations. Probability of such effect registration increases for quiet magnetic conditions.
- Effect of the splitting IAR maximums on two satellites was detected. The morphology of this phenomenon is analyzed.
- Experiments for the synchronous IAR observation in the space and on the Earths ground were made. SRS was synchronously detected at the satellite and by ground base magnetometer or synchronously undetected. The frequency spacing is the same in the space and on the ground.

Thank You

Magnitude of the splitting