EPSC Abstracts,
Vol. 4, EPSC2009-277, 2009
European Planetary Science Congress,

Detailed investigations of new observational data of the sporadic S-burst Jovian radio emission from microsecond to macroscopic timescales

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Abstract

An investigation of the Jovian sporadic radio emission properties is still an actual astrophysics problem. The generation mechanism of S- bursts is a matter of debate. In the present time due to the modern technologies it is possible to increase the temporal and frequency resolutions of the observed data and to look at the S-burst signal from macroscopic viewpoint to a microsecond timescale. Now such an approach seems to be effective for the understanding as the physical features of S-bursts as well as properties of the radiation source [1].

New Jovian S-bursts Observations

In this presentation we demonstrate the results of the Io-B Jovian storm emission data processing which were obtained in October-November 2008 with the Ukrainian world largest telescope of the decameter range UTR-2 and modern equipment with high frequency and temporal resolutions (Digital Signal Processors (DSP) and the Waveform Receiver (WFR)) [2]. New experiments were carried out with the unique combination of main observational parameters: sensitivity (effective area of the antenna is near 100 000 m^2.), frequency range (from 12…16 MHz to 33 MHz), time resolution (1ms), frequency resolution (4 kHz), dynamic range (~90 dB), continuous duration of the observations (~4h). In the Figure 1 one characteristic example of Jovian dynamic spectrum obtained with 1 ms time resolution of Io-B source radio emission is demonstrated.

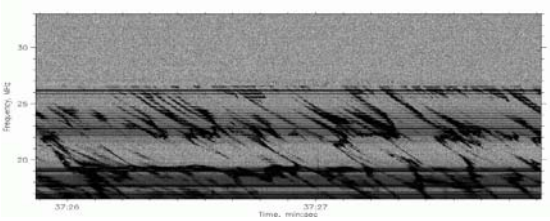

Figure 1: Dynamic spectrum of Io-B emission (UTR-2, 30 Oct. 2008, time. res. = 1 ms)

Data Processing

The obtained data of the Jovian S-burst radio emission were processed with Fourier as well as with wavelet transform methods. Wavelet analysis allows to reach the time resolution till 150 ns. Large set of Jupiter DAM radio emission specialties was detected. Main attention was put on the analysis of the fine and super-fine structures of S-bursts (up to microsecond level) [3] including the search of microstructure along and across of the bursts.

References

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