

EGU22-5222

<https://doi.org/10.5194/egusphere-egu22-5222>

EGU General Assembly 2022

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Fluctuations of the solar wind ion flux near the Earth bow shock

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In our study we analyzing fluctuations of the solar wind ion flux associated with the Earth bow shock using data obtained by the BMSW experiment, installed onboard the SPEKTR-R satellite. The high time resolution of the spectrometer (0.031 s for the plasma flux magnitude and direction and 1.5 s for velocity, temperature, and density) makes it possible to study fine structures in detail.

From 2011 to 2019 SPEKTR-R satellite crossed the Earth bow shock many times. In our work we analyzed more than 200 bow shock crossings including multiple ones. More than half of them had fluctuations near the Earth bow shock front.

It was shown that in 25% of events the frequencies of ion flux fluctuations were in the range of 3-4 Hz. In 5-7% of events the frequencies of ion flux fluctuations lay in the interval of 5-6 Hz. Just few cases had frequencies of ion flux fluctuations equal or more than 7 Hz. In other cases the frequencies of ion flux fluctuations were lower than 3 Hz or no fluctuations were observed at all.

We also observed low-frequencies fluctuations about 0.1 Hz and lower. These fluctuations were also visible by the 1.5 s plasma parameters: protons density and velocity; He⁺⁺ (alpha particles) density and velocity (including helium abundance).