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Spectra of temperature fluctuations in the solar wind

Zdenek Nemecek, Jana Šafránková, Alexander Pitňa, and František Němec
Faculty of Mathematics and Physics, Charles University, Prague 8, Czechia (nemecek@aurora.troja.mff.cuni.cz)

Turbulent cascade transferring the free energy contained within the large scale fluctuations of the magnetic field, velocity and density into the smaller ones is probably one of the most important mechanisms responsible for heating of the solar corona and solar wind and thus the turbulent behavior of these quantities is intensively studied. However, the temperature is also highly fluctuating quantity but behavior of its variations is studied only rarely. There are probably two reasons, first the temperature is tensor and, second, an experimental determination of the temperature variations requires knowledge of the full velocity distribution with a time resolution and such measurements are scarce. To overcome this problem, the Bright Monitor of the Solar Wind (BMSW) on board the Spektr-R spacecraft uses the Maxwellian approximation and provides the thermal velocity with 32 ms time resolution. We use these measurements and complement them with 10 Hz magnetic field observations from the Wind spacecraft propagated to the Spektr-R location and analyze factors influencing the shape of the temperature power spectral density. A special attention is devoted to mutual relations of power spectral densities of different quantities like parallel and perpendicular temperature, magnetic field and velocity fluctuations and their evolution in course of solar wind expansion.