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Turbulent spectrum downstream of the Saturn's bow-shock: Cassini observations

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MHD turbulence within the Saturn's magnetosheath is investigated using magnetic field data taken by Cassini during the 1st and 2nd orbits. At frequencies below the ion cyclotron frequency ($f < f_{ci}$), we observe generation and growth of mirror structures as already been seen by Voyagers 1 and 2 downstream of a quasi-perpendicular bow-shock. The amplitude and scale of the structures increase with distance from the shock front. However, in the close vicinity of a quasi-perpendicular bow-shock we observe a region dominated by Alfvénic fluctuations. The MAG/Cassini instrument covers not only the low frequency range, but it allows a study of the turbulent fluctuations at $f > f_{ci}$ as well. Independently on the nature of the fluctuations at low frequencies (mirror or Alfvénic), we find in this range, that the total power spectral density follows a well defined power law $\sim f^{-3}$. An onset frequency of these turbulent spectrum, however, seems to be sensitive to the nature of the fluctuations: while the Alfvénic fluctuations dominate the low frequency part of the spectrum, the small scale cascade starts from a frequency close to f_{ci}; in the region occupied by mirror structures, these cascade starts immediately above a frequency corresponding to the Doppler shifted scale of the structures. We compare these results with turbulent spectra observed within the magnetosheaths of the Earth and Jupiter.