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Venus Express observations of magnetic field fluctuations in the magnetosheath: A case study and a statistical study

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Using magnetosheath crossings of Venus Express on two consecutive days, we investigate magnetic fluctuations in the same locations for two extreme interplanetary magnetic field orientations, i.e. nearly along and nearly perpendicular to the solar wind flow. The strength and properties of the fluctuations are strongly controlled by the types of the upstream bow shock. The magnetic fluctuations behind a quasi-parallel bow shock are quite strong and turbulent, having a strongly varying angle α_{eB} between maximum variance direction of the fluctuations and the direction of the magnetic field, and may be convected from the upstream wave region in the foreshock. The magnetic fluctuations behind a quasi-perpendicular bow shock are less intensive and wave-like, showing a less perturbed angle α_{eB}, and are probably generated locally by some instability. Based on the Venus Express observations in 2006 and 2007, we also investigate the spatial distributions of magnetic field fluctuations in the Venus magnetosheath statistically. Both the compressional and transverse components of the field fluctuations decrease as the θ_{Bn} angle (the angle between the interplanetary magnetic field and the bow shock normal) increases.