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Statistical analysis of flow direction and its variations in different types of solar wind streams

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The efficiency of the solar wind interaction with the Earth's magnetosphere is determined not only by the values of solar wind parameters, but also by the direction of its flow. As a rule, the slow quiet and uniform solar wind extends radially, but at the same time there are different large-scale solar wind streams, that differ in the values of the plasma parameters and in the flow direction. The most significant changes of solar wind flow direction can be observed in areas of stream interaction, for example Sheath (compression regions before the fast interplanetary coronal mass ejections) and CIR (corotating interaction regions, that are predate high-speed flows from coronal holes) [1]. In the present study, using plasma measurements on the WIND spacecraft, the statistical distributions of the values and fluctuations of flow direction angles in the solar wind were analyzed. The angles variations were considered on temporal scales from several ten seconds to an hour. The statistical distributions in the quiet solar wind and in various large-scale solar wind streams using the catalog of large-scale solar wind phenomena from the ftp://ftp.iki.rssi.ru/pub/omni/catalog were compared [2].

At the result of this work, it was shown , that maximum values of modules longitude (φ) and latitude (θ) angles, and of their variations are observed for Sheath and CIR regions, the probability of large deviations from the radial direction (>5 degrees) also increases. Meanwhile the dependence on the solar wind type reduces with decreasing scale. The relation of the values and fluctuations of the direction angles on the values of the plasma parameters in the solar wind were also analyzed.

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