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The statistical characteristics of the directional changes triggered substorms

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For understanding the magnetospheric substorm onset it is necessary to find out whether substorm onset is always externally triggered or sometimes is a result of internal processes, which can be observed for example during northward oriented interplanetary magnetic field i.e. in the time when there is no significant flux transfer. Large directional changes in the solar wind flow, especially observed during the northward oriented interplanetary magnetic field, can result in large-scale windsock motion of magnetotail. It can lead to current sheet thinning and force magnetic reconnection in magnetospheric tail, which consequently can lead to substorm onset.
We analysed case studies of concurrent observations of the solar wind OMNI and Geotail data of distant tail's response. We present here a statistical study of the temporal resposes of magnetotail to the vertical directional changes in the solar wind flow.