THEMIS-E衛星データを用いた磁気圏尾部で磁場擾乱の統計解析
Statistical Analysis of Severe Magnetic Fluctuations in the near-Earth Magnetotail Observed by THEMIS-E

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We made a statistical analysis of severe magnetic fluctuations in the nightside near-Earth plasma sheet at |X| = 6 - 12 R_E, which is considered as a necessary cause for current disruption (CD) in the inside-out substorm model. We used magnetic field data for two years of 2013 and 2014 with a sampling rate of 4 Hz, obtained by the THEMIS-E satellite. The 1283 severe fluctuation events were identified as $sigma_B$ / $average_B$ > 0.5, where $sigma_B$ and $average_B$ are standard deviation and average value of magnetic field intensity during the time interval of local gyroperiods. We found that the occurrence rates of severe fluctuation events are extremely low (0.00118%, 0.00899% and 0.0238% at |X| = 6 - 8 R_E, 8 –10 R_E and 10 –12 R_E, respectively), and most of them last for no more than 15 s. The superposed epoch analysis of AL index and magnetic field variations indicate that they occur associated with sudden decrease of AL index value and magnetic field dipolarization. Meanwhile, 62% of events were accompanied by ion flow with v > 100 km/s. Superposed epoch analysis of the flow speed indicates that flow speed increases before the severe magnetic fluctuations. This fact suggests that the magnetic fluctuations are caused by the ion flow, and contradicts the suggestion of inside-out model that the fluctuations cause earthward ion flow by reducing the tailward pressure-gradient force. These results indicate that the inside-out model can only be suitable for relatively small amount of substorm cases. In the presentation, we plan to show the actual distance between event location and the neutral sheet, using Tsyganenko Model (T01).

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