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Magnetosphere Expansion On Recovery Phase Of Recurrent Magnetic Storms

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We report THEMIS observations of prolonged magnetospheric expansions (PMEs) when the magnetopause position was shifted more than 3 RE outside the location predicted by models. Such prominent expansions promote trapping and accumulating relativistic electrons in the outer radiation belt. Comprehensive analysis of corresponding solar wind and geomagnetic conditions revealed that the PMEs with duration of several days occurred during periods of low solar wind dynamic pressure on recovery phase of recurrent magnetic storms. The low dynamic pressure in the solar wind is often accompanied by long-lasting intervals of quasi-radial interplanetary magnetic field (IMF), which appear on the trailing side of fast solar wind streams from coronal holes. Those intervals are characterized by very low efficiency of solar wind energy transfer through the magnetosheath to the magnetosphere. The total (gas and magnetic) pressure observed by THEMIS in the magnetosheath adjacent to the magnetopause was down to 20% of the far upstream solar wind dynamic pressure that is much less than gas-dynamic model prediction of 84%. Hence, the PMEs result from low solar wind dynamic pressure, which impact to the magnetosphere is additionally reduced during quasi-radial IMF.