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Influence of the large and sharp solar wind pressure pulses on the magnetosphere: several case studies

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The effect of the large and sharp solar wind dynamic pressure changes on the magnetosphere and ionosphere was considered. It was shown that the geosynchronous magnetic field changed after the pressure pulse arrived at the Earth. Increasing (decreasing) in the solar wind pressure resulted in increased (decreased) in the geosynchronous magnetic field magnitude. Geosynchronous energetic particle fluxes also changed: on the dayside magnetosphere dynamic pressure enhancements caused energetic particle fluxes increases, while on the nightside magnetosphere energetic particle fluxes response depended on the interplanetary magnetic field orientation (IMF). For southward IMF condition, substorm-like injections were observed on the nightside magnetosphere.
Auroral responses to the large and fast solar wind dynamic pressure pulses, accompanied by northward and southward IMF orientation, were compared. It was found that growth/drop of solar wind pressure during northward IMF led to an enhancement/weakening of luminosity intensity at the dayside of auroral oval. Case studies revealed that solar wind pressure pulse enhancement accompanied by southward IMF led both to the dayside auroral brightening and was a trigger for the pseudobreakup or substorm onset. After the passage of the solar wind pressure pulse auroral activity became weaker. In other words, solar wind pressure pulse during the southward IMF can cause not only pseudobreakup or substorm onset, but also can control development of this auroral disturbance.