The thesis addresses of two regions significant for the solar wind-magnetosphere coupling: the cusp in high geomagnetic latitudes and the low-latitude (LLBL) subsolar magnetopause. A penetration of plasma of a solar origin into the magnetosphere could be realized directly through magnetospheric cusps. The region adjacent to the magnetopause in the cusp vicinity is highly turbulent, occupied by the heated magnetosheath–like plasma with a low drift velocity for which occurrence of vortices is a very common feature. In the first part of the thesis, we present a detailed analysis of a vortex-like structure created by a turbulent plasma flow around the magnetopause indentation above the cusp and using the data from Interball-1 and Magion-4; we find necessary conditions and a possible mechanisms to creation of such structures. The second part concerns the low–latitude boundary layer formation, its spatial structure and temporal changes based on THEMIS multipoint observations. In spite of its crucial role in transfer of mass, momentum, and energy from the solar wind into the magnetosphere, LLBL parameters and their relations to upstream conditions are still under debate. We demonstrate that sudden changes in upstream plasma and magnetic field parameters could lead to reformation of the spatial LLBL profile from smooth to apparently non-monotonous. Disturbances at the magnetopause surface suggested to be the main reason of the distortion of the spatial structure of this layer. In details, we study LLBL passages in order to determine sources of transient events. A monitor of magnetosheath parameters is principal for an interpretation of magnetopause transients. It was found that the changes of the B Z sign could be a cause of the magnetopause deformation and could reform the LLBL.