Increase of critical frequency of ionospheric F2-layer before onset of substorm expansion phase

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It is known that a magnetospheric disturbance arises as a result of an interaction of the magnetosphere with the inhomogeneous flow of the solar wind plasma. When the front of interplanetary shock from the Sun contacts with the Earth's magnetosphere, the storm sudden commencement (SSC) or the sudden magnetic impulse (SI) appears. The magnetosphere compression takes place. The point is that before the interplanetary shock waves being propagated in the collision-free plasma, regions exist what are known as the foreshocks. An example of this type of region is a plasma-wave turbulence formed before the front of near-Earth shock or a turbulence before the interplanetary shock. The last turbulence will influence the magnetosphere ***several hours*** before SI.

Little-known mechanisms of formation of ΔfoF2 ionospheric positive peaks during 6-8 hours before To (onset of the expansion phase of an isolated substorm) are considered in details. They are connected with an impact of the high-speed particles in the foreshock region of solar wind on the Earth's magnetosphere. Here, the main feature is an entirely other channel of solar wind penetration in the ionosphere. This channel realizes the transmission of energy through the entry layer into the inner magnetosphere and through the day-time cusp into the ionosphere as distinct from the classical channel which describes all three substorm phases, namely, through the magnetospheric tail, plasma sheet and auroral ionosphere. The ionospheric effect due to cusp and magnetospheric entry layer manifests most likely at high latitudes (polar cap and auroral oval). Enhancement of ΔfoF2 values can be used for prediction of the ionospheric disturbance onset and accordingly of space weather problems, radio propagation and so on.