

GPS- Slips during magnetic storms at high latitudes.

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Satellite navigation and communication systems are an integral part of the modern society infrastructure. Therefore, the requirements for the efficiency and reliability of the recent are increase. This is especially true for the developing new or remote areas with poor for a number of reasons infrastructure. Analysis applied aspects of navigation and communication systems shows that the current reliability of their operation is determined not only and not so much instrumental failures, but increasingly the influence of various geological and heliophysical factors - space weather, that is more pronounced at high latitudes.

As the slips (failures) are discussed "instrumental" phenomena - the phase losses and pseudorange faults. In addition, we study an important ionospheric parameter TEC, and its variations, the values of which can not bear the physical sense and explains the known process in the ionosphere and magnetosphere.

The paper discusses the influence of various strong geomagnetic disturbances (magnetic storms with amplitude 1500-2500 nT) during 2010-2014 on the working of 100 GPS- stations located north of 550N. We have analyzed the dynamics of manifestation of GPS signal slips in a significant (above 1 month) time period around the date of the geomagnetic disturbance. Especially consider the chain of stations, orientation predominantly in the latitudinal direction and located in Alaska, Canada, northern Europe. So it is possible to study the dynamics of the impact of high-latitude ionosphere to the received satellite signal. The obtained data for the occurrence of failures compared not only with the behavior of the high-latitude geomagnetic indices AE and AL, but also with the direct detection of the magnetic field and measurements of the absorption. Thus, the probability of failure for the L2 phase, even in quiet conditions receiving several times greater than for the phase L1. The presence of geomagnetic disturbance leads to an increase of this magnitude in the 5-20 times for the considered magnetic storms. Failure rate in determining the TEC significantly - 100 times - more than a purely instrumental and also grow during the solar magnetic geophysical disturbances of different nature. The analysis shows that a possible solution to reduce the impact of failures on the navigation GPS system is to increase the mask on the elevation angle of the satellite upto 15-20 deg.

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