



Ionospheric scintillation detection based on GPS observations, a case study over Iran

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Global Positioning System (GPS) which is used extensively for various purposes such as navigation, surveying, remote sensing and telecommunication, is strongly affected by the earth's upper atmosphere, the ionosphere. Ionosphere is a highly variable region with complex physical characteristics in which the density of free electrons are large enough to have considerable effects on signals' propagation travelling through this dispersive medium. As GPS signals travel through the ionosphere, they may experience rapid amplitude fluctuations or unexpected phase changes. This is referred to as ionospheric scintillation. Ionospheric scintillation which is caused by small scale irregularities in the electron density, is one of the dominant propagation disturbances at radio frequency signals. These irregularities severely affect the accuracy and reliability of GPS measurements. Therefore it is necessary to investigate ionospheric scintillation and its effects on GPS observations.

The focus of this paper is to detect ionospheric scintillations over Iran's region, during different periods of solar activity and to investigate these effects on GPS observations in more detail. Furthermore the effects of these irregularities on regional modeling of ionosphere over Iran is also investigated. The results show that effectiveness of this phenomenon depends on geographic location, local time and global geomagnetic storm index (kp index). The required data for this investigation are ground based measurements of permanent GPS stations over Iran, established by the National Cartographic Center of Iran (NCC).