

Ionospheric irregularities impact on PPP

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ABSTRACT

As is commonly known, as any other ionized medium, the Earth's ionosphere disperses the transitioning electromagnetic signals. As the strength of the dispersion is dependent on wavelength and the electron density, it gives the possibility to describe the state of the ionosphere.

Although TEC is the most commonly used and elaborated ionosphere state descriptor, which performance over the years has proven to be adequate in most scientific and practical scenarios of GNSS use, in some specific, more demanding cases it is not sufficient to bring expected quality of the information of ionospheric impact on traversing GNSS signal.

One of those cases is Precise Point Positioning (PPP). While TEC products present the absolute content of free electrons in the ionosphere, for PPP the dynamics of the ionosphere are far more important, as the GNSS signal passing through the ionosphere is affected by its rapid changes and the resulting position of the receiver can be largely affected and strongly differ in short period of time. In that case the knowledge of total electron content is not enough, as it gives no information on ionospheric disturbances and small-scale structures which affect the transionospheric GNSS signal the most.

In this work we present the results of studies over ionospheric impact on Precise Point Positioning. For different ionospheric conditions and different magnetic latitudes we have performed the series of case studies to search for the dependence of PPP accuracy and precision on the ionospheric dynamics and irregularities, compared to TEC.

Keywords: GNSS, ionosphere, irregularities, PPP