

Monitoring ionospheric scintillations with the permanent global network of geodetic GPS receivers: results and limitations.

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The detection of ionospheric scintillations at a global scale using permanent GPS dual frequency receivers from the worldwide IGS network is the main objective of a prototype service developed in the scope of the ESA Space Weather Pilot Project (<http://scintillations.cls.fr>). 30 s and 1 s sample rate observations are processed to estimate ionospheric scintillation activity indicators such as losses of lock ratio, signal amplitude or phase fluctuations. An empirical scintillation index is derived from the classical ROTI index. Hourly maps (about 50 stations) and daily maps (around 350 stations) are generated routinely. For equatorial region and polar region that are the most affected by such erratic ionospheric irregularities, we have established long time series of scintillation occurrences. For the very old-standing GPS sites, data are available since 1993, that is to say a solar cycle. We have identified the solar peak effect especially at low latitudes but also the well known diurnal and seasonal signatures of the scintillations. We have also tried to separate the effects of scintillations from the effects of strong TEC gradients.

Some results are encouraging. They put forward a clear response of the GPS receivers to the ionospheric scintillations. However it should be noted that the response is receiver type sensitive. Other results underscore that the geodetic GPS receiver repetition rates are at the border of the phase signal scintillation spectra. Next step is to realize permanent calibrations with several Ionospheric Scintillation Monitors (ISM) at IGS collocated sites.