

The temporal dependence of GPS cycle slip in low-latitude region

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Cycle slip is a typical anomaly phenomenon for GPS carrier phase measurements and frequent occurrence of cycle slip would greatly degrade the quality of GPS positioning. Although the degradation of GPS signal to noise or even the loss of lock related with radio wave interference have been found during severe solar radio burst event accompanying with solar flare, long-term studies show that for a given GPS receiver, loss of lock or cycle slip with higher satellite elevations is mainly caused by deep signal fade or strong phase fluctuation related to the ionospheric irregularities.

Using the Global Positioning System (GPS) cycle slip (CS) data detected from the observation of six GPS stations over China low latitude region, the temporal dependence of CS occurrence and its reason is analyzed, it is founded that the variations of CS with local time, seasons and solar cycle are obvious. First, the diurnal dependence of CS occurrence detected from six GPS stations is obvious and the distribution of CS occurrence with local time is very similar. On the whole, from 01 LT to 19 LT the CS seldom occurs, the CS occurrence increases at about 19 LT, reaches maximum at the time about 22 LT then decreases gradually. This temporal distribution of CS occurrence is related with the diurnal variation of ionospheric irregularities above certain intensity level over the low latitude region. Second, the seasonal dependence of CS occurrence is also obvious, and the CS occurs more frequently in the equinox months than that in other months, which is coincided with the seasonal occurrence of ionospheric scintillation over Asia-Pacific longitude sector. Besides the synoptic seasonal distribution of CS occurrence, the CS occurrence at some special period behaves an obvious consistency in these six stations. Lastly, the CS occurrence shows some connections with the geomagnetic activity, the cases of inhibiting and generating effect of the geomagnetic activity on CS occurrence are found during the active solar years. It is suggested that these dependences of the CS occurrence are related with the variations of the ionospheric irregularities or scintillation in low-latitude region.