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Influences of the day-night differences of ionosphere on the GPS DCB estimation

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The estimation of differential code bias (DCB) of GPS system is one of the necessary steps for total electron content (TEC) derivation from GPS measurements. Usually, the method for estimating the GPS DCBs follows the assumption of the gentle temporal and spatial variation of the ionosphere, but this assumption is just an approximation because of the ionosphere's inherent variability. It has been indicated that the estimated GPS satellite DCBs are sometimes influenced by the ionospheric conditions. Here, we demonstrate a possible influence of ionospheric condition that differs between day and night on the estimated DCBs from measurements of a single GPS station. It is found that the average standard deviations (STDs) of the satellite DCBs estimated with daytime data are higher than that with the nighttime data. To reduce this day-night difference effect on GPS DCB determination, we use an improved estimation method based on the primary features of the ionospheric variability with local time. A local time dependent weighting function was introduced into the original least-squared DCBs estimation algorithm. A test with data for BJFS station (39.60°N, 115.89°E) in 2001 indicates that the STD of the DCBs decreases from 2.533 TECU to 2.308 TECU, or by 8.9%, after the improved method was applied. For comparison, another test for the same station in 2009 indicates that the STD decreases from 1.344TECU to 1.295 TECU.

Reference

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