Geophysical Research Abstracts
Vol. 19, EGU2017-7921, 2017
EGU General Assembly 2017

Reduction of kinematic short baseline multipath effect based on Multipath Hemispherical Model

Miaomiao Cai (1,2), Wen Chen (1,2), Danan Dong (1,2), Le Song (1,2), Chao Yu (1,2)

(1) Engineering Center of SHMEC for Space Information and GNSS, East China Normal University, Shanghai, China (mmcai@outlook.com), (2) Shanghai Key Laboratory of Multidimensional Information Processing, East China Normal University, Shanghai, China

Multipath effects are omnipresent in GNSS positioning and attitude determination. Especially in the applications of short baseline, differential GNSS technology can eliminate most of common errors, such as satellite and receiver clock error, atmosphere and ionosphere delay, while the baseline multipath still remains due to its site-specific property. Recently, many studies and applications for multipath reduction adopted post-processing approaches and are only applicable for static multipath environment, while for kinematic case are basely studied. Theoretical investigation indicates that the spatial-repeatability-based multipath mitigation approaches are not only suitable for static environment, but also for kinematic platforms when the dominant multipath effects arise from the moving platform itself. Previous studies have validated the feasibility of the MHM approach in static environments, which utilizes the spatial-repeatability of multipath effects under static environment and corrects the multipath effect based on the satellite orbital trace in the sky. In this paper, we extend this method to kinematic shipborne environment, where the dominant multipath effects come from the ship itself. A static and a kinematic shipborne tests are conducted to validate the feasibility of MHM approach in kinematic environment. The results indicate that after MHM multipath mitigation the RMS of baseline length deviations are reduced by 10.47% and 10.57%, and the RMS of residual values are reduced by 39.89% and 21.91% for the static and kinematic test, respectively. The results have demonstrated the feasibility of MHM in kinematic shipborne environment, however, the factors affecting the performance of MHM still require further investigations. Power spectrum analysis indicate that MHM is more effective in mitigating low-frequency multipath effects, while the high-frequency multipath effects (indistinguishable from observation noise) still remains. Besides, the observation noise was quantitatively assessed and after mitigating this effect the residual reductions grow to 41.68% and 24.51% for two tests. And the influence from spatial coverage and resolution were also investigated to further improve the performance of MHM approach.

Keywords: GPS; multipath hemispherical map; multipath mitigation; kinematic shipborne environment