Ionospheric Effect Modelling for Long-baseline Kinematic GPS Application

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SUMMARY

The ionospheric effect is considered as the most important error limiting the quality of the GPS positioning. When baseline lengths grow longer, the ionospheric bias becomes decorrelated. Therefore, in such condition, resolving the GPS carrier phase ambiguities is a veritable challenge. In long-baseline static GPS applications, the use of the dual frequencies permits to eliminate the main effect of the delay caused by the ionosphere. Nevertheless, for kinematic applications, this approach alters the integer nature of the phase ambiguities. These constraints are especially encountered in accurate marine applications when it is almost impossible to reduce the distance between the base and the rover receiver.

In this paper, the developed approach is based on the analysis of the auto-correlation function of the double difference ionospheric residuals and the use of Kalman filtering method for long-baseline kinematic GPS applications. An experimentation was performed by the National Centre of Space Techniques (CNTS) to determine the trajectory of a boat in the large of the West Mediterranean sea by using the GPS kinematic positioning method. The obtained results show that the developed method permits to determine baselines of about 80 km with an accuracy of a few centimetres.

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