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Application of Predictive Regional Ionosphere Model to Medium-Range RTK Positioning

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A b s t r a c t

Real Time Kinematic (RTK) GPS positioning over longer distances requires a support of atmospheric (ionospheric and tropospheric) corrections, since the atmospheric errors decorrelate with the growing distances and cannot be completely eliminated by double differencing of the satellite observations. Currently, the most commonly used approach is to derive the atmospheric corrections at the reference station network and provide them in real time to the roving receiver. Another solution, proposed here, is to use predictive atmospheric models in order to derive the atmospheric corrections. This paper presents the test results of the performance assessment of the predictive ionosphere model (UWM-IPM) application to medium-range RTK positioning. The rover data collected within 25 to 67 km from the closest reference station were processed in the kinematic mode with the support of the ionospheric corrections derived from the UWM-IPM model. The RTK solution was derived in both single- and multi-baseline modes, and compared to the two reference solutions obtained without the ionospheric corrections. All numerical tests were carried out using the MPGPS software developed in cooperation with The Ohio State University; a recent extension to the software, developed at the University of Warmia and Mazury in Olsztyn, introduces the predictive ionosphere model to the RTK solution. The test results are

very promising, and indicate that predicted ionosphere corrections can effectively support medium-range RTK positioning, and allow for fast ambiguity resolution over distances of several tens of kilometers under moderate ionospheric conditions.

Key words: GPS, RTK, precise positioning, ionosphere.