Experimental Assessment of Achievable Accuracy of GNSS-Derived Heights from Carrier Phase-Based Positioning Techniques for Ellipsoidally Referenced Hydrographic Surveys

Hungkyu Lee, Yunsu Choi, Guenwoo Ham and Seonghyeon Yun (Republic of Korea)

Key words: GNSS/GPS; Hydrography; Positioning; PPP; ERS

SUMMARY

Vertical datum is a one-dimensional coordinate system which defines the metric distance of a point from reference surface along a well-defined path. It enable to be categorized according by type of surfaces to which the coordinate is referenced, for instance tidal, geodetic (e.g., geoid) and ellipsoidal surface. While hydrographic surveys have traditionally been carried out with respect to the tidal datum for establishing nautical charts, topographic data is collected relative to the geodetic datum for topographic mapping. However, integration of these spatial data recently becomes indispensable for coastal zone management. In the hydrographic society, these has been a demand for overcoming a technical challenge in the traditional approach, which establishes relationship between the instantaneous water level (IWS) and chart datum (CD). This was because uncertainty in the relationship between IWS and CD is one of major error sources which increases the overall depth uncertainty. To this end, ellipsodially referenced survey (ERS) becomes one of the challenging issues in the hydrography. If bathymetric data is collected relative to the reference ellipsoid, it can be readily related either to the geodetic datum or to the chart datum by application of a series of geoscientific models, such as geoid, hydrodynamic and sea surface topographic model. It is well known that the ellipsoidal height is effectively and precisely derived by the so-called global navigation satellite systems (GNSS). Even though the differential GNSS positioning based on pseudo-ranges has long been preferred method of data processing for hydrographers, but it does not fit ERS due to its limited positioning accuracy, especially for height component. Hence, precise point positioning (PPP) has recently received attention as a potential positioning scheme for ERS because it does not require to setup and operate a control station as well as is free from baseline lengths. In this study, some GNSS data has been collected from field trials on static and kinematic scenarios and processed on PPP mode by an open source and a commercial GNSS software package. Results were analyzed to evaluate achievable accuracy of the PPP-derived heights and to examine some facts affecting into the accuracy. Hence, details of the

field tests and the data processing are provided and discussed in this presentation with a view to applying the PPP technique for the ellipsodially referenced hydrographic surveys.