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Determining Components of Deflection of the Vertical in Owerri West Local Government, Imo State Nigeria Using Least Square Method

Authors : Chukwu Fidelis Ndubuisi, Madufor Michael Ozims, Asogwa Vivian Ndidiamaka, Egenamba Juliet Ngozi, Okonkwo Stephen C., Kamah Chukwudi David

Abstract : Deflection of the vertical is a quantity used in reducing geodetic measurements related to geoidal networks to the ellipsoidal plane; and it is essential in Geoid modeling processes. Computing the deflection of the vertical component of a point in a given area is necessary in evaluating the standard errors along north-south and east-west direction. Using combined approach for the determination of deflection of the vertical component provides improved result but labor intensive without appropriate method. Least square method is a method that makes use of redundant observation in modeling a given sets of problem that obeys certain geometric condition. This research work is aimed to computing the deflection of vertical component of Owerri West local government area of Imo State using geometric method as field technique. In this method combination of Global Positioning System on static mode and precise leveling observation were utilized in determination of geodetic coordinate of points established within the study area by GPS observation and the orthometric heights through precise leveling. By least square using Matlab programme; the estimated deflections of vertical component parameters for the common station were -0.0286 and -0.0001 arc seconds for the north-south and east-west components respectively. The associated standard errors of the processed vectors of the network were computed. The computed standard errors of the North-south and East-west components were 5.5911e-005 and 1.4965e-004 arc seconds, respectively. Therefore, including the derived component of deflection of the vertical to the ellipsoidal model will yield high observational accuracy since an ellipsoidal model is not tenable due to its far observational error in the determination of high quality job. It is important to include the determined deflection of the vertical component for Owerri West Local Government in Imo State, Nigeria.

Keywords : deflection of vertical, ellipsoidal height, least square, orthometric height
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