Review Form 1.6

Journal Name:	**Journal of Geography, Environment and Earth Science International**
Manuscript Number:	**Ms_JGEESI_81459**
Title of the Manuscript:	**Comparative Analysis of the Molodensky and Kotsakis Ellipsoidal Heights Transformation between Geocentric and Non-Geocentric Datums Models**
Type of the Article	**Original Research Article**

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This journal's peer review policy states that **NO** manuscript should be rejected only on the basis of '**lack of Novelty'**, provided the manuscript is scientifically robust and technically sound.
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PART 1: Review Comments

	Reviewer's comment	**Author's comment** *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Compulsory REVISION comments	**1. Introduction** Correct: "Practical height computation from the processed observed GNSS data requires**"**. Correct: "Ellipsoidal heights are theoretical heights received from the GNSS observations' Correct: "Non-geocentric datum ellipsoidal heights are not readily available in most of the GNSS observation areas and regions." Correct: "using the orthometric heights of the existing control" Correct: "However, ellipsoidal heights are applied to the GNSS observation for theoretical height adjustment, likewise orthometric height to spirit levelling for practical heights reduction." Correct: "The orthometric heights are measured along the gravity vector direction" Correct: "The ellipsoidal and orthometric heights have their respective reference surfaces." Rephrase: "The erroneous use of the orthometric height for GNNS observations processing to obtain local ellipsoidal heights of points is as a result of the unavailability of ellipsoidal heights in the observation area or region.' → "The erroneous use of the orthometric height for GNNS observations processing to obtain local ellipsoidal heights of points is as a result of the unavailability of ellipsoidal heights in the observation area or region." Correct: "The erroneous use of the orthometric heights for the GNNS observations processed to obtain local ellipsoidal heights of points is as a result of the unavailability of the ellipsoidal heights in the ~~observation area or region~~ study area." Correct: "The Clarke 1880 ellipsoid adopted for geodetic computation in Nigeria is flatter and bigger compared to the WGS 84 ~~ellipsoid~~". Correct: "The conversion can be achieved through the application of the 5-parameters Molodensky's model and the 8-parameters Kotsakis model for ellipsoidal heights transformation between the geocentric and non-geocentric Datums, as well as reference frames". Correct: "The adopted methodology involves the transformation of geocentric datum (WGS84) ellipsoidal heights obtained from the GNSS observations to local ellipsoidal height in the Nigeria Minna datum using the Molodensky and Kotsakis methods and comparing their results." Correct: "as well as transformation parameters between the WGS84 and Minna Datums, and the two Datums, as well as ellipsoids properties (semi-major axis and flattening)."	
Minor REVISION comments	The authors presented a study that well suits to the topics if 'geodesy', 'cartography' and 'Earth science'. They comparatively analyzed the Molodensky and Kotsakis ellipsoidal heights transformation between geocentric and non-geocentric Datums. They determined the accuracy using mathematical formulae and illustrated the methods. they also estimated the reliability of the Kotsakis model. In this study they determined the range of the discrepancies of the Kotsakis model and found that it is limited to be between -0.1775 to 1.7459m. The authors claim that the low accuracy of the model may result from the two rotation datum shift parameters. The authors have also determined the accuracy of the Kotsakis model to be 1.244m which proved the actuality of this research for geodesy domain. Fig. 1 well illustrates the relationship between WGS84 and Clarke 1880 ellipsoids. The subsections 2.1 The 5-Parameters Molodensky Model and 2.2 The 8-Parameters Kotsakis Model well describe the mathematical background for the methodology. The subsection 2.3 Transformation Parameters between WGS84 and Minna Datum (Clarke 1880 Ellipsoid) demonstrates the transformation parameters from WGS84 to Minna datum. The authors compared the Nigerian geodetic datum (Clarke 1880 ellipsoid) and WGS84 ellipsoid semi-major axes in subsection 2.4 The Nigerian Geodetic and WGS 84 Datums. The techniques for claculations of the Root Mean Square Error (RMSE) as a model used to indicate accuracy and reliability, is provided in the subsection 2.5. Root Mean Square Error	

	(RMSE). The authors desribe the details of the Methodlogy in p. 4: they used a total of 11 GNSS points located within Edo State in the study. The observation of the points was carried out with 5 dual-frequencies GNSS receivers. The geographic coordinates and ellipsoidal heights of the points were processed on the WGS84 ellipsoid using the Compass Post-processing software as the study involves the transformation of global dataset to local. It gives an understanding of the approach and techniques of methods supported by Table 1 showing geographic latitudes, longitudes and ellipsoidal heights of stations. Afterwards, the authors describe how they computed the difference in heights. Specifically, the changes in ellipsoidal heights between the WGS84 and Clarke 1880 spheroids and the Clarke 1880 ellipsoidal heights regarding the Molodensky model were respectively computed using equations (1) and (5). The details are given in page 5 and illustrate the print screens for the Molodensky and Kotsakis models. In Table 2 the authors present the discrepancies in the ellipsoidal heights and Root Mean Square Error, RMSE of the Kotsakis model. The results are presented in a clear and logic way. The paper is structured according to the journal standards (Introduction-Methods-Results-Literature). Therefore, the paper can be published after minor revision is done.	
Optional/General comments	The study presents a comparative analysis between the ellipsoidal heights of the two local geodetic Datums. The authors comparatively analysed the Molodensky and Kotsakis models of the coordinate transformation method. Th aim was to compare the transformation of ellipsoidal heights between the geocentric and non-geocentric Datums, and to determine the reliability of the Kotsakis model compared to the Molodensky. They used the GNSS data of the selected stations and processed them in WGS84 datum to obtain their global geographic coordinates and ellipsoidal heights. They applied the coordinates, ellipsoidal heights and the transformation parameters between WGS84 and Minna Datums and compared them for the cases of Molodensky and Kotsakis models. The Molodensky model was used as a primary, while the Kotsakis model ellipsoidal heights were compared to the Molodensky, in order the heights discrepancies between the both. They also computed the residuals in both models. The authors found that the Kotsakis model has a low reliability and accuracy. It could be a result of the two rotation datum shift parameters, as they are the main differences between the two models	

PART 2:

	Reviewer's comment	**Author's comment** *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Are there ethical issues in this manuscript?	*(If yes, Kindly please write down the ethical issues here in details)*	

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