

NUR FATIHAH BINTI MOHD ROSLI

BACHELOR OF SURVEYING SCIENCE AND GEOMATICS (HONOURS)

AUGUST 2023

VERTICAL ACCURACY ASSESSMENT OF FUSION GLOBAL
DIGITAL ELEVATION MODEL (NASADEM AND MERIT) OVER
PENINSULAR MALAYSIA

NUR FATIHAH BINTI MOHD ROSLI

2021868154



SCHOOL OF GEOMATICS SCIENCE AND NATURAL RESOURCES
COLLEGE OF BUILT ENVIRONMENT
UNIVERSITI TEKNOLOGI MARA MALAYSIA

AUGUST 2023

**VERTICAL ACCURACY ASSESSMENT OF FUSION
GLOBAL DIGITAL ELEVATION MODEL (NASADEM
AND MERIT) OVER PENINSULAR MALAYSIA**

NUR FATIHAH BINTI MOHD ROSLI

2021868154



**Thesis submitted to the Universiti Teknologi MARA Malaysia
in partial fulfilment for the award of the degree of the
Bachelor of Surveying Science and Geomatics (Honours)**

AUGUST 2023

DECLARATION

I declare that the work on this project/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA (UiTM). This project/dissertation is original, and it is the result of my work, unless otherwise indicated or acknowledged as referenced work.

In the event that my project/dissertation be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree of the Bachelor of Surveying Science and Geomatics (Honours) and agree be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

Name of Student : Nur Fatimah Binti Mohd Rosli
Student's ID No : 2021868154
Project/Dissertation Title : Vertical Accuracy Assessment of Fusion Global Digital Elevation Model (NASADEM and MERIT) over Peninsular Malaysia
Signature and Date : 10/08/2023

Approved by:

I certify that I have examined the student's work and found that they are in accordance with the rules and regulations of the School and University and fulfils the requirements for the award of the degree of Bachelor of Surveying Science and Geomatics (Honours).

Name of Supervisor : Sr. Mohd Azril Bin Che Aziz
Signature and Date :

11/8/2023

MOHAMMAD AZRIL CHE AZIZ
Pensyarah Kanan
Pusat Pengajian Sains Ukur & Geomatik
Fakulti Senibina, Perancangan & Ukur
Universiti Teknologi MARA
Cawangan Perlis, Kampus Arau
Email: azril060@uitm.edu.my

ABSTRACT

This study focuses on to assess the vertical accuracy of the fusion Global Digital Elevation Model (GDEM) comprising NASADEM and MERIT datasets over Peninsular Malaysia. The primary objectives were to derive the vertical accuracy of fusion GDEM based on landuse classification and to improve the accuracy of fusion GDEM by fit to the local vertical datum. To achieve these objectives, the study utilized LIDAR datasets to assess the vertical accuracy by comparing the elevation surfaces between LIDAR datasets and the fusion GDEM datasets. This analysis involved subtracting the elevation values to determine the discrepancies. In addition, the MERIT dataset, which exhibited the best Root Mean Square Error (RMSE) for landuse classification, was identified as the optimum fusion GDEM. To align the fusion GDEM with the local vertical datum, a Corrective Vertical Datum (CVD) approach was employed. The CVD method involved calculating the difference between the EGM96 geoid surface and the MyGEOID, which was used to fit the MERIT dataset to the local vertical datum. The results demonstrated that the MERIT dataset performed well in urban, forest and non-forest areas, with vertical accuracy RMSE values of 4.334 m, 6.744 m, and 6.081 m respectively meanwhile NASADEM performed worst for each area which urban with 9.394 m, forest 9.304 m and lastly 8.888 m for non-forest area. The new MERIT dataset, which was fitted to the MyGEOID, exhibited improved accuracy, and successfully aligned with the local datum in Peninsular Malaysia, as indicated by an RMSE value of 2.627 m. In comparison, the MERIT dataset fitted to EGM96 provided an RMSE value of 3.012 m. Although the difference was slight, the new MERIT dataset aligned with the local datum, demonstrating its suitability for accurate geospatial applications in Peninsular Malaysia. In conclusion, this study assessed the vertical accuracy of the fusion GDEM over Peninsular Malaysia, focusing on landuse classification. By incorporating lidar datasets and employing the CVD method, the fusion GDEM was aligned with the local vertical datum, resulting in improved accuracy. The findings highlight the effectiveness of the fusion GDEM, particularly the new MERIT dataset, for geospatial analyses and applications in the region.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	ABSTRACT	iii
	ACKNOWLEDGEMENT	iv
	TABLE OF CONTENT	v
	LIST OF FIGURES	viii
	LIST OF TABLES	x
	LIST OF ABBREVIATIONS	xi
1	INTRODUCTION	
	1.1 Background Study	1
	1.2 Problem Statement	3
	1.3 Research Questions	5
	1.4 Aim and Objectives	5
	1.5 Significance of Study	5
	1.6 Scope and Limitation of Study	6
	1.6.1 Software Used	6
	1.6.2 Study Area	8
2	LITERATURE REVIEW	
	2.1 Introduction	10
	2.2 Digital Elevation Model (DEM)	10
	2.2.1 Global Digital Elevation Model	12
	2.2.2 Fusion Global Digital Elevation Model	13
	2.2.3 NASADEM	14
	2.2.4 MERIT	14
	2.3 Reference Geoid Model	15
	2.4 Method to Generate DEM	16