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TEMPORAL DYNAMICS OF SEAFLOOR COMPOSITION: ANALYSING CHANGES USING GREY LEVEL CO-OCCURRENCE MATRIX (GLCM) ANALYSIS AND MULTIBEAM BACKSCATTER DATA

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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.

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ABSTRACT

This research is to analyse changes in the texture of seafloor composition over time by analysing Gray Level Co-occurrence Matrix (GLCM) and multibeam backscatter data from 2020 to 2021. The study objectives to evaluate temporal changes in seafloor sediment texture, analyse the changes of the seabed composition from 2020 to 2021, also generate temporal seabed classification maps. The findings indicate that specific GLCM features significantly evolve over the study period, with the GLCM Mean showing strong agreement with sediment classes derived from the ARA sediment map. The research anticipates generating temporal classification maps to enhance understanding of sediment dynamics in coastal areas, contributing to advanced seabed mapping also ecosystem monitoring. Finally, the key GLCM layers were clustered using the K-Means technique, and the results were compared to ARA classifications. According to the results, PCA determined that the GLCM layers of Variance, Contrast, and Mean contributed 99.97% (2020); PCA 1 90.67%, PCA 2 5.60% and PCA 3.70% and 99.98% (2021); PCA 1 91.52%, PCA 2 5.18% and PCA 3 3.28% of total variance. The principal component analysis (PCA) demonstrated that the GLCM layers of variance, contrast, and mean contributed significantly to the overall variance, suggesting their usefulness in sediment categorization. Among these layers, GLCM Mean demonstrated good agreement with sediment classes from the ARA sediment map. The work effectively developed temporal categorization maps, which improved our understanding of sediment processes in coastal locations. These findings help to develop seabed mapping and ecosystem monitoring, offering useful tools for environmental management and coastal planning. The findings demonstrate the usefulness of employing GLCM and multibeam backscatter data to capture and analyse seafloor texture dynamics.

Keywords: Multibeam, Grey Level Co-occurrence Matrix, Backscatter, Seabed Classification, Angular Range Analysis, Primciple Component Analysis, sediment texture

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