UNIVERSITI TEKNOLOGI MARA

COTIDAL DATASETS ESTIMATION USING SPATIAL INTERPOLATION METHODS IN GEOGRAPHICAL INFORMATION SYSTEM

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ABSTRACT

Some locations along the Malaysian coast do not have any tidal data due to the absence of tide observation. Tide observation stations established by the Royal Malaysian Navy (RMN), International Tidal Survey, and Department of Survey and Mapping Malaysia, along the Malaysian coast are inadequate to gather tidal data at points of interest. Moreover, the existing tide observation stations have limited the usage of tidal data to cover all working areas along the coastal line. Hence, an alternative approach to estimate tidal data, which is a concept of cotidal dataset, has been introduced to provide tidal dataset. This is because gathering cotidal dataset does not require physical tide gauge to be positioned at working areas as well as the need for tide observation for a long period of time. As such, this study presents the estimation of cotidal datasets at selected study areas by employing the spatial interpolation methods and evaluate its output. Interpolation of tidal data from multiple tide observation stations is required in cotidal approach. Hence, three spatial interpolation methods were carried out at two locations along the coast of Peninsular Malaysia as testing grounds. With that, a comparative study of the tidal levels between tidal data acquired from RMN and cotidal dataset through statistical analysis was performed. The accuracy of the cotidal dataset based on the performances of spatial interpolation methods was evaluated by referring to the accuracy tolerance drawn by the International Hydrographic Organization (IHO). In addition, the output of cotidal dataset was examined to see how well the cotidal dataset estimation. The final analysis was sensitivity testing to ascertain the consistency spatial interpolation methods in estimating tide heights. Based on the results, it was discovered that the accuracy of the cotidal dataset estimation and output are within the acceptable limit drawn by IHO. The significance of cotidal dataset is in terms of saving time, cost, and effort to acquire reliable tidal data and information, especially for related organizations involved in hydrographic and new coastal development. The concept of cotidal dataset is in its advent in estimating oceanographic variables, particularly in coastal areas.

ACKNOWLEDGEMENT

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CHAPTER ONE

INTRODUCTION

1.1   Research Background

Tide observations provide information on the safe depth of the sea to navigators. It can also be utilized for coastal development. Gauging the tide depth at tide observation stations is vital in order to acquire real tidal data. Then, the real tidal data are processed using mathematical calculations or electronic digital computer to produce detailed tide information such as tidal constituents, tidal levels as well as tidal predictions (NOAA, 2001). These tide information become necessary in meeting the demands of related authorities or agencies and by the public generally.

However, there are locations along the Malaysian coast where tidal data are not collected due to the absence of tide observations (NHC, 2015). Typically, tide observations are carried out for a sufficiently long period of time i.e. one month (NOAA, 2000). This method of gathering data at a place of interest with no existing tide information consumes a lot of time.

Estimation of spatial data becomes the most convenient way to produce oceanographic variables (Hess, 2002). Instead of doing tide observations for a long period of time, estimations of tidal data which is a concept of cotidal dataset can be done as the method does not require the installation of physical tide gauges at the place of interest. It also solves the problem of limitations in the number of existing tide observation stations.

A cotidal dataset can be acquired from the interpolation of tidal data from two or more tide observation stations**.** The acquisition of cotidal datasets using spatial interpolation methods is carried out using the GIS as a tool. The GIS is a computer-based tool used to map and analyze things that exist and events that happen on Earth. It is capable to analyze and display datasets on the computer. The GIS can store, manipulate, analyze and display relationships between phenomena happening on the Earth's surface (Chang, 2010).

Thus, it is important to evaluate cotidal datasets results obtained from spatial interpolation methods to conclude whether the spatial interpolation method can