LONG-TERM SPATIOTEMPORAL ANALYSIS OF LAKE SURFACE WATER AREA CHANGES IN SOUTHEAST ASIA

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1. INTRODUCTION

Southeast Asia (SEA) has a strong regional climate with high relative humidity. It is covered by hundreds of lakes that are critical to the sustainability of ecosystems and human welfare in the region. Lakes are crucial for ecosystems and services, water supply, agriculture, tourism, and recreation [1]. Both direct and indirect factors, such as anthropogenic activities and climate variability and change, have had severe impacts on lakes' surface water and their extent [2]. This research aims to monitor change in lake surface water areas across the whole SEA by delineating and analyzing multi-resolution long-term satellite imagery. There are 767 lakes in Myanmar, Thailand, Laos, Cambodia, Vietnam, and Malaysia that are at least 1 km^2 in size.

2. METHODOLOGY

In this analysis, the Global Surface Water (GSW) and HydroLAKES datasets were employed. To produce the lake surface water areas, the GSW dataset was used. The HydroLAKES dataset was used to locate the lakes and create the optimal lake buffer selection. Moreover, in the methodology, extracting the surface water areas monthly from 2000 to 2019 was delineated using the concave hull. In addition, map generalization methods were applied to ensure spatial and temporal consistency of data. The gap-filling data was applied to check the trend for each lake.

3. RESULTS

A particular surface water analysis for each lake reveals spatial and temporal patterns for specific times or seasons. The monthly surface water area is mapped. This aids comprehension of the local events. Furthermore, the trends for each lake have been indicated in time series from January 2000 to December 2019. Figure 1 shows a trend of Tonle Sap Lake, which is the largest lake in SEA. The lake has an increasing trend, which shows a good fit trend using a variable sinusoid.

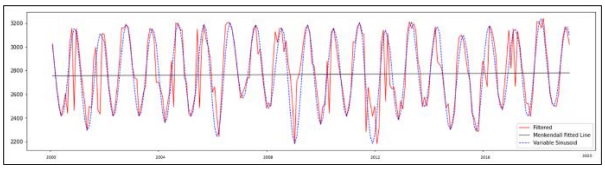

Figure 1. Monthly surface water area changes in Tonal Sap Lake from 2000 to 2019

4. CONCLUSIONS

Each lake has been estimated for long-term surface water area changes using the GSW dataset, which has a high spatial resolution of 30 meters. Using fine spatial and temporal datasets was a challenge for delineating the surface water extents, especially for small lakes. Preliminary results thus reveal spatial and temporal patterns of surface water extent dynamics, essential for understanding the relative impacts of changing climate and land uses. In future work, this surface water database will be used with climate data, such as rainfall and runoff for both historical and future time frames. The main basin for each lake will also be identified for correlation with climate data.

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