A ROBUST APPLICATION OF GOOGLE EARTH ENGINE FOR ESTIMATING SURFACE SUSPENDED SEDIMENT CONCENTRATION (SSSC) DYNAMICS IN MEKONG DELTA

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ABSTRACT
Water from the upstream rivers, streams, and lakes within the Greater Mekong basin transport suspended sediment to the delta. This sediment does not only play an important role to the ecological and agricultural livelihood of millions of people in the delta, but also contributes to the geomorphologic change and water quality of lower Mekong River. Over the last decade, the rapid economic development, changes in land use pattern, and dam constructions in the basin have significantly influenced the amount of suspended sediment depositing on the delta. However, there is a limited amount of research having focused on suspended sediment dynamics at the Mekong delta scale. Therefore, this research develops the "Mekong Data SSSC Explorer" application that automates the process to quantify the information of SSSC in Mekong delta. The application will fill in the gaps of scientific information about SSSC dynamics in the Mekong delta, and help inform the related stakeholders including policy makers and water managers, and foster data driven policy for water management in order to achieve the sustainable development goal 6 on "Ensure availability and sustainable management of water and sanitation for all" in the Mekong delta as well as the Greater Mekong Basin.

The Mekong Data SSSC Explorer is an open-source-code web app with a main functionality to estimate the SSSC in every 14 days from 2013 to the present, and at a high accurate level (in average around 2 mg/L). The app allows public users to intuitively geo visualize the SSSC of the river, analyze the SSSC time series in terms of graphics and export the estimated SSSC data to CSV for further analysis. The source code is stored on GitHub repository and can be accessed publicly without any restriction.

Mekong Delta SSSC Explore is built on Google Earth Engine, a cloud computing platform for planetary research, and uses the remote sensing principle to estimate the SSSC based on the interaction between the suspended sediment and electromagnetic energy. The app adopted Markert' et al. s algorithm (2018), which is an empirical model, using the reflectance value of surface water from Landsat 8 Collection 1 as the primary input for the estimation of the SSSC. In addition to the model, the app implements the Function of Mask (CFMask) algorithm to remove clouds from Landsat8 Level-1 image collection, and applies the Dynamic Surface Water Extent (DSWE) which is an algorithm for automated extraction of surface water at high confidence level, in order to effectively estimate the SSSC.

Mekong Delta SSSC Explore demonstrates that the recent innovation in such Google Earth Engine, and the empirical relationship between suspended sediment concentration and remote sensing observation is a reliable and effective method for delivering the SSCC data in Mekong level.

Fig. 1. The interface of Mekong Delta SSSC Explore

$$SSSC = 10^{1.90353307 \times 2.718281828459045 \times e^{1.44788939 \times \log\frac{\text{Band}_{Green}}{Band_{Red}} + 0.62996462}}$$

Equation. 1. The expression used in this study to estimate the SSSC based on green and red band of Landsat8.

REFERENCES

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