

EGU21-15059

<https://doi.org/10.5194/egusphere-egu21-15059>

EGU General Assembly 2021

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Adaptive ML-Models for analysis of TSS, Chlorophyll-a, in mixed water type scenarios in Ca Mau peninsula, Vietnam

Long Vu Huu^{1,2}, Andreas Schenk¹, and Stefan Hinz¹

¹Institute of Photogrammetry and Remote Sensing (IPF), KIT, Karlsruhe, Germany

²Space Technology Institute, VAST, Hanoi, Vietnam

The multispectral mission of Sentinel-2 enables reliable, affordable and continuous environmental monitoring systems in fields like agriculture, biodiversity, environmental hazards and surface water. Several studies have proven that main water quality parameters like total suspended solids (TSS) and chlorophyll (Chl-a) can be estimated from multispectral data using different methods and algorithms. However, independently of the specific approach, these algorithms are selected and optimized to work primarily for one of the main water types i.e. open water, coastal water or inland water. This is also shown by the fact that there is not a single universal algorithm, which can be applied to all water types with consistent and reliable performance at the same time.

Ca Mau peninsula is a spacious area located in the southern part of the Mekong Delta, with an area of around 1.6 million hectares. This area has high growth rates of agricultural and aquaculture production, hence diverse water demands and water use types. In this study we use Sentinel-2 remote sensing data to monitor surface water quality using adaptive ML models to account for the different surface water types which occur in this area. Through using remote sensing data, we can provide a synoptic and sufficient view in spatial aspects about water quality parameters in the Ca Mau peninsula. Adapting the ML model will address the bio-optical model for a mixed water scenario.

The study is based on Sentinel-2 satellite images acquired in 2019 and 2020, supplemented by field data, i.e. hyperspectral measurements using close range observations, in-situ measurements and water samples, with the aim to collect a comprehensive reference data set as biophysical parameters are closely connected with spectral parameters at close range as well as at high spectral resolution. Therefore, surface hyperspectral measurement has been used to simulate Sentinel 2 multispectral image data at the respective bands.

We automatically assign the water type classes to observed surface water by integrating GIS data and remote sensing as the pre-processing step. For each class, the ML models are trained based on the experimental measurements with the multispectral and the simulated multispectral images on the respective water types. We devote special attention to water type boundaries to provide a smooth transition of estimated parameters.

The outputs of this model are surface water quality distribution maps with turbidity, TSS, and Chl-a

parameters for all areas in Ca Mau peninsula, independent of the actual water type. Through the acceptable accuracy of model testing, the consolidation model will contribute water quality parameters that are crucial and meaningful to the planning and use of water for domestic use and production, besides, it also supports the decision-making of sustainable water use.