Geophysical Research Abstracts
Vol. 20, EGU2018-7929-1, 2018
EGU General Assembly 2018

Land Cover / Land Use Mapping in the Mekong Delta, Vietnam, with focus on pond aquaculture and paddy rice utilizing time series of Copernicus Sentinel data

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Paddy rice and pond aquaculture are important for Vietnam's food security and contribute significantly to the GDP through exports. Knowledge about the production of rice and aquatic goods is significant in the contexts of food security, water management, trade policy, greenhouse gas emissions and hydrological modelling. Aquaculture ponds and paddy fields in Asia are often located in vulnerable regions, such as costal lowlands and river deltas, which are susceptible to sea level rise, floods and droughts, salt water intrusion and other hazards while at the same time battling issues of urban encroachment, stagnating yields and increased demand due to population growth.

The Sentinel-1 satellites are the first constellation that offers a free and open data archive of high spatial and temporal resolution SAR data with a global coverage. This vast amount of data is particularly suited for time series analysis and holds great potential for future land use/land cover (LU/LC) change assessments. We present two studies showing the potential of Sentinel-1 for pond aquaculture and rice mapping. The study area for all studies was the complete Mekong Delta, Vietnam.

Pond aquaculture was mapped by using Sentinel-1 time series, water thresholding, open-source segmentation algorithms and the derivation of shape parameters to differentiate aquaculture ponds from other water bodies. For the paddy rice mapping study we used a superpixel segmentation algorithm to create Sentinel-1 time series at the object level, instead of the pixel level, and derived rice area as well as seasonality by means of a straight forward decision tree algorithm. To manage the large data volume we devised workflows that incorporated cloud computing via Google Earth Engine for data processing. All products have been calculated at 10m spatial resolution.