Geophysical Research Abstracts
Vol. 21, EGU2019-2260, 2019
EGU General Assembly 2019

Remote sensing of invasive plant species in an aquatic ecosystem using the Sentinel-2 image time series: Eichhornia crassipes case on the Al Kabir River – Lebanon

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Eichhornia crassipes is an invasive plant species that is widely distributed worldwide. In Lebanon, it has been developing since 2006, in the El Kabir River, forming the northern border with Syria.
Remote sensing is often used to map large areas of Eichhornia crassipes. In our case, the river corridor is narrow, which limits the use of the main remote sensing methods. We developed a new image analysis method based on a time series of satellite images and sub-pixel information.
Our method is based on a calendar of vegetative cycles in the river corridor where Eichhornia crassipes development occurs after the development of the other plant species of the riparian zone.
Satellite images are from Sentinel 2 and the Eichhornia crassipes surface extraction method is based on an estimate of the variations in the vegetation surface from a reference date, separating the two growing cycles.
The vegetation area is estimated from the Fractional Vegetation Cover (FVC) calculated from the SAVI vegetation index.
The Eichhornia crassipes surface area is derived from the time series of FVC obtained by difference with the values existing at the moment of separation of the growing cycles between the riparian plant and the invasive species.
The results obtained over the years 2015 to 2018 make it possible to locate the sectors colonized by Eichhornia crassipes on the corridor, to monitor Eichhornia crassipes development and to estimate the total area of colonization in the water corridor.
Then, such results could help stakeholders in plant control and especially the ecologist of invasive plant.