

Researchers improve the algorithm that describes the hydrological changes in Mediterranean wetlands

March 25 2021



Credit: Asociacion RUVID

Researchers from the Cavanilles Institute of Biodiversity and Evolutionary Biology at the University of Valencia, in collaboration with the University of Castilla-La Mancha, have perfected the existing genetic programming (GP) algorithms to analyze water fluctuations in

the Mediterranean wetlands of the Iberian Peninsula. In an article published in the journal *Remote Sensing* they have shown that this method improves the existing techniques of water mapping, especially for shallow lakes and temporary wetlands such as the Mediterranean ones.

Genetic programming is a methodology inspired by [biological evolution](#) and natural selection to automatically develop programs or algorithms that perform, by computation, a user-defined task. This is not the first time these techniques have been used to analyze hydrological changes. A study by researcher Carolina Doña –who also signs this article– developed GP algorithms, which significantly improved the techniques used so far to study fluctuating systems, such as Mediterranean [wetlands](#). In Doña's research, published in 2016, images of Landsat satellites were analyzed and, using GP techniques, the algorithms that best fit different types of Mediterranean wetlands were selected.

Now, the recent study has validated the GP algorithm and analyzed all the main types of wetlands in the Mediterranean basin of the Iberian Peninsula, although these techniques also help analyze all the Mediterranean regions of the world. "This alternative methodology greatly improves water forecasts and reconstructions, so that errors are greatly reduced," explains Antonio Camacho, Professor of Ecology at the University of Valencia and one of the researchers in the article. This way, the possibilities of using [remote sensing](#) methods to establish the water coverage and water pattern of Mediterranean aquatic systems, fundamental ecological characteristics for these types of ecosystems, would be greatly improved.

In addition, the research has been validated with the new generation of European satellites, specifically with the images of Sentinel-2A and 2B satellites, thus improving the temporal and spatial resolution. As Camacho comments, equivalences have been made between the

algorithms, now developed by Sentinel, to see in which systems the algorithm has been better adapted and in which not. "For some it is not adequate and that is why it is necessary to continue working, but in any case they always significantly improve the methodologies that existed until now," explains the professor.

Wetlands as climate allies

The analysis of wetlands as carbon sinks and reducers in the amounts of greenhouse gases (GHGs) in the atmosphere is vital in mitigating [climate change](#). Since the new methodology validated in the recent article measures water cover and its temporal evolution, it can assess the availability of [water](#) resources and reveal the natural functioning of aquatic ecosystems and relate them to their climate mitigation capacity.

"The study of wetlands and their effects on [climate change](#) are largely determined by the hydrological pattern, so the validation of the GP [algorithm](#) covers part of the methodological needs to reveal the role of the wetlands to combat climate emergency," explains Camacho, who leads research on the LIFE Wetlands4Climate and CLIMAWET-CONS projects to help achieve climate neutrality in 2050 using nature-based solutions.

More information: Carolina Doña et al. Estimation of Water Coverage in Permanent and Temporary Shallow Lakes and Wetlands by Combining Remote Sensing Techniques and Genetic Programming: Application to the Mediterranean Basin of the Iberian Peninsula, *Remote Sensing* (2021). [DOI: 10.3390/rs13040652](https://doi.org/10.3390/rs13040652)

Provided by Asociacion RUVID

Citation: Researchers improve the algorithm that describes the hydrological changes in Mediterranean wetlands (2021, March 25) retrieved 7 August 2024 from <https://phys.org/news/2021-03-algorithm-hydrological-mediterranean-wetlands.html>

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