

Water-sediment physicochemical dynamics in a large reservoir in the Mediterranean region under multiple stressors

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ABSTRACT

Nowadays, the Mediterranean freshwater systems face the threat of water scarcity, along with other multiple stressors (e.g. organic and inorganic contamination, geomorphological alterations, invasive species), leading to the impairment of their ecosystem services. All these stressors have been speeding up, due to climate variability and land cover/ land use changes, turning them into a big challenge for the water management plans. The present study analyses the physicochemical and phytoplankton biomass (chlorophyll-a) dynamics of a large reservoir, in the Mediterranean region (Alqueva reservoir, Southern Portugal), under diverse meteorological conditions and land cover/land use real scenarios (2017 and 2018). The most important stressors were identified and the necessary tools and information for a more effective management plan were provided. Changes in these parameters were further related to the observed variations in the meteorological conditions and in the land cover/land use. The increase of nutrients and ions in the water column were more obvious in periods of severe drought. Further, the enhancement of nutrients concentrations, potentially caused by the intensification of agricultural activities, may indicate an increased risk of water eutrophication (see Figure 1).

The results provide information to the decision-makers, to build strategies on how to avoid a higher deterioration of the water quality in the Alqueva reservoir, induced by interacting and synergistic effects of climate change and LULC management. It is essential to promote the sustainability of LULC, with the control of agriculture areas in the basin and the implementation of sustainable environmental management practices. In fact, the adaptation solutions based on LULC changes would seem the most effective to address reservoir water quality issues, and therefore territorial planning can play an important role in adaptation and mitigation in this region.

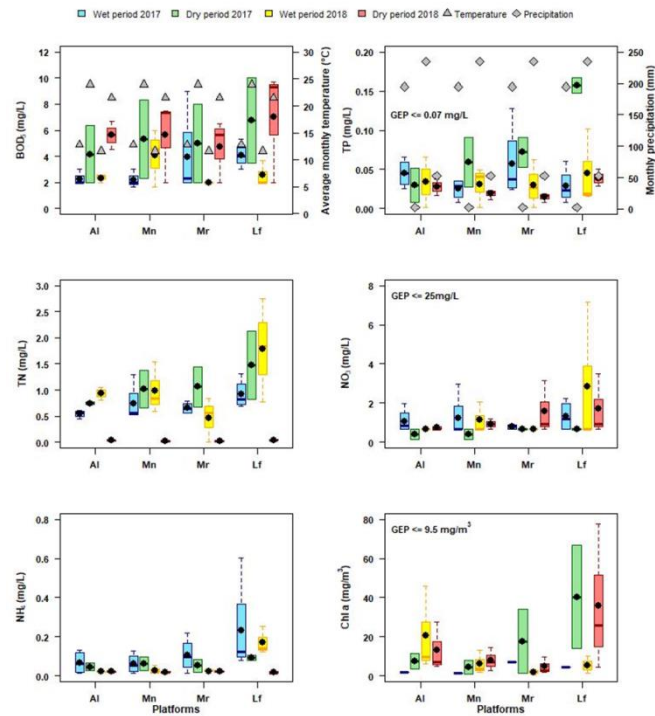


Figure 1. Spatial and temporal variation of the organic descriptors, nutrients, and Chl-a in the water samples during the period of the study. The black circles indicated the mean, the line across the box represents the median, and the bottom and top of the box show the standard error. Recommended guide levels for the good ecological potential (GEP) are indicated in the plot (APA, 2016).

REFERENCES

Agencia Portuguesa Ambiente (APA) Plano de Gestão de Região Hidrográfica 2016/2021: Região hidrográfica do guadiana (RH7); 2016

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