EGU23-4181, updated on 16 Apr 2024
https://doi.org/10.5194/egusphere-egu23-4181
EGU General Assembly 2023

Phosphorous losses in flood events in a Mediterranean agroforestry catchment: effects of rainfall characteristics and land use

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Runoff generated after rainfall of high magnitude and/or with high intensity transport soil and sediments that finally reach rivers and water bodies affecting water quality. All land uses can contribute to the problem, but in particular croplands are considered important nonpoint sources of phosphorous losses. The aim of this research was to evaluate the phosphorus delivery and transport after flood events in an agroforestry catchment, in which woodland and cropland are the dominant land uses. To this purpose sediments were collected in five trap MATs distributed across the catchment. A total of 20 sampling campaigns were carried out during five years, in which rainfall events of different characteristics (total precipitation and intensity) were recorded. Besides P concentration, particle size and other properties such as soil organic matter (SOM), low frequency magnetic susceptibility (χLF) and Ti concentrations were analysed in the sediment trapped in the MATs to relate them to the provenance of the sediment. The rainfall events recorded in each campaign were analysed and the campaigns were grouped using a cluster analysis taken into account the characteristics of the collected sediments. The study reveals a P enrichment in the sediments compared to the soils under all land uses, with the greatest P concentration associated to sediment rich in clay and SOM. However, the sediment showed lower χLF than the soils. P losses were higher at the catchment outlet than at the headwaters. These results are explained by two main factors: the higher water volumes accumulated at the outlet and the greater contribution of cropland to P losses compared to the other land uses, since cropland occupies a greater area at the outlet of the catchment. Our findings also confirmed the clear influence of the precipitation concentration on P losses, which suggest that under the increase of events of high intensity projected under climate change scenarios, the mobilisation of P and its loss, in particular from croplands will increase, which could exacerbate water pollution.