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P mobilization by an extreme rainfall event and its spatial variability in an agroforestry South-Pyrenean catchment

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High intensity rainfall events produce not only significant soil losses but also nutrient losses which act as important sources of water pollution. In particular, those erosion processes contribute significantly to phosphorous (P) losses and its transportation along the catchments. The high-intensity events that occurred during the last decade and the projected increase under climate change scenarios, suggest the need for a more in-depth analysis of the associated effect of rainfall on the mobilization and export of P from a catchment. Nevertheless, the P losses are influenced not only by rainfall characteristics but also by land use and by soil properties. The agricultural lands have been pointed out as the main contributor to P losses, but other landscape elements should be taken into account. In addition, the form in which P is linked to soil particles also conditions the processes. The aim of this research was to evaluate the effects of an extraordinary event on P mobilization in areas under different land use in an agroforestry catchment of the South Pyrenean region (Aragón, Spain), as well as the variability in the processes along the channel beds in three nested subcatchments. P concentrations in soils under different land use and the sediments in the channels were assessed before and after an extreme event in three nested sub-catchments and related to other soil properties. The results showed that in the study catchment, P was mostly linked to the mineral fraction (mainly to silicates), while the binding between P and OM was only observed in the soils under forest land use. The high intensity rainfall event produced a significant change in the particle size distribution with the loss of fine material (clay and silt) and OM leading to an enrichment of the sediments in P. It was also confirmed that, in addition to the agricultural lands, which had the highest P concentration and were more prone to suffer erosion and contribute to P release, the channel banks and the own beds of the channels should be considered as contributors to P exportation. The higher P concentration in the channel beds after the extreme events leads to higher P levels exposed to be eroded. The variability of P concentration along the nested channels was in agreement with the increase of magnitude of the erosion processes along the streams.