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From drought to flood: tracing size DOM molecular distribution changes along a Mediterranean river under hydrological extremes.

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Dissolved organic matter (DOM) comprises a complex mixture of organic substances that represents the basic resource of carbon and energy for fluvial ecosystems. Thus, the study of DOM availability, transport, release and degradation is pivotal to understand the relevance of lotic ecosystems on the carbon cycle. Further, since quantity and quality of DOM inputs are strongly modulated by the occurrence of extreme hydrological episodes such as droughts and floods, it is crucial to explore how these hydrologic extremes impact on the magnitude of the internal DOM processing.
Noticeably, most of the studies that focus on DOM longitudinal changes are constrained to basal flow conditions or droughts, meanwhile floods have been understated. This is an important gap, because in Mediterranean regions, droughts and abrupt flood episodes are a key hydrological feature of these ecosystems. Therefore a full understanding of the biogeochemical functioning of these systems need to integrate all spectra of hydrological conditions.
In this framework, the present study specifically focuses on the in-stream quantitative and qualitative DOM changes, in term of size molecular distribution, during its transit along a fluvial continuum. Specifically, the study was conducted in a medium-sized Mediterranean river impacted by anthropogenic inputs and exposed to abrupt floods episodes and periodical severe summer droughts.
Having in mind this fissure in our knowledge, this study was performed under baseflow, drought and flood conditions.
High Performance Size Exclusion Chromatography (HPLC-SEC) combined with a fluorescence detector is used to describe DOM size distribution changes related to humic and protein-like substances. According to the "size-reactivity" model by Amon and Benner (1996) the molecular weight is considered a crucial aspect of DOM availability for microbiota. Although a consistent relationship between molecular weight and (potential) bioavailability cannot be asserted, the study of DOM size distribution properties represents an essential step to detail qualitative transformations that affect DOM in aquatic ecosystems.
A large input of a homogenous pool of large terrigenous DOM fractions is expected during flood conditions with a parallel nil in-stream processing of these substances as consequence of the low water residence time. In contrast, the input of anthropogenic DOM characterized by a heterogeneous pool of organic substances should be more evident under baseflow and mostly during drought conditions. Therefore, if this external DOM pool represents a source of reactive substances the in-stream processing of these substances should emerge.