

Impact of flash flood events on the distribution of organic pollutants in surface sediments from a Mediterranean coastal lagoon (Mar Menor, SE Spain)

V. M. León¹ · R. Moreno-González¹ · V. García¹ · J. A. Campillo¹Received: 29 January 2015 / Accepted: 27 April 2015
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Abstract The influence of flash flood events on the input and distribution of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorinated pesticides (OCPs) in surface sediments from the Mar Menor lagoon were characterized in this study. These contaminants were analyzed in surface water samples collected during two flash flood events in the main surface watercourse which flow into the Mar Menor lagoon. Surface sediments were sampled semiannually before and after flash flood events. The total input of PAHs, OCPs, and PCBs (sorbed + dissolved) during two flash flood events was estimated at 0.98, 1.32, and 0.34 kg, respectively, the main input corresponding to p,p'-DDE (1.00 kg). The distribution of organic contaminants in surface sediments was not homogeneous as a consequence of the presence of many simultaneous sources and different meteorological, hydrodynamic, and physicochemical conditions. **As a consequence of flash flood events, p,p'-DDE concentrations in surface sediments increased significantly in the central and south zones of the lagoon. However, in the case of PCBs, a dilution effect was observed in the south zone after such events, reducing the environmental risk. These changes in the pollutant distribution persisted at least 1 year later (autumn 2010), showing that the impact of flood events in the distribution of persistent organic contaminants in Mediterranean**

coastal lagoons is of relevance according to the ecological risk assessment carried out. The impact of these events should be also considered in other coastal systems, especially in semiarid and semiconfined areas.

Keywords PCBs · Organochlorinated pesticides · PAHs · Flash flood input · Sediment · Coastal lagoon · Seasonal variation

Introduction

The input of contaminants into marine systems takes place mainly through air deposition, industrial, and urban wastewater effluents, river discharges, groundwaters, and surface run-offs. However, the relevance of each of these pathways in a specific area varies according to the physicochemical properties (hydrophobicity, volatility, etc.) of each contaminant as well as other factors (meteorological conditions, anthropogenic discharges, hydrodynamism, etc.). Many studies have been carried out to estimate the transport of nutrients and organic and inorganic contaminants by rivers into the sea (Steen et al. 2001; Gómez-Gutiérrez et al. 2006), but less information is available about the influence of flash flood events. In some areas, such as the Mediterranean Sea, inputs through rivers and wadis can be especially relevant during flash flood events, representing a significant part of the total yearly input (Velasco et al. 2006). Flood events favor sediment transport thanks to their capacity to deliver sufficient kinetic energy to mobilize surface soils and entrain the sediments (Vericat and Batalla 2010). The effects of flooding events on the levels of contaminants in soils and sediments have been assessed in rivers (Ollivon et al. 1999; Sicre et al. 2008; Maliszewska-Korybach et al. 2012; David et al. 2012; Martínez-Santos et al. 2015) and lakes (Wycisk et al. 2005). In some cases,

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✉ V. M. León
victor.leon@mu.ico.es

¹ Instituto Español de Oceanografía, Centro Oceanográfico de Murcia, Apdo. 22, C/ Varadero 1, 30740 San Pedro del Pinatar, Murcia, Spain