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Relationships between El Niño-Southern Oscillation and nitrogen concentrations in a Western Mediterranean river

J. Sigro (1), T. Vegas-Vilarrúbia (2), S. Giralt (3), M. Brunet (1,4)

(1) Centre for Climate Change (C3). Geography Department. University Rovira i Virgili. Tarragona, Spain, javier.sigro@urv.cat, (2) Department of Ecology, Faculty of Biology, University of Barcelona, Barcelona, (3) Department of Sedimentary Geology. Institute of Earth Sciences "Jaume Almera". Spanish National Research Council (CSIC). Barcelona, Spain, (4) Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich, UK

El Niño-Southern Oscillation (ENSO) is the dominating mode of interannual climate variability at global scale (Brönnimann, 2007). ENSO extreme negative and positive phases can significantly influence on climatic conditions in Europe, affecting precipitation mainly in spring and autumn (Mariotti et al., 2002; Moron and Ward 1998), but also during winter (Brönnimann et al., 2007; Pozo-Vázquez et al., 2005). Over the Iberian Peninsula (IP), ENSO teleconnections can modulate the frequency and intensity of precipitation (Brunet and López, 1991; Rodó et al., 1997; Rodríguez-Puebla et al., 1998), with a time-lag between the ENSO and its effect on precipitation ranging from 3 to 21 months (Rodó et al., 1997). Large areas of the IP are also affected by severe droughts during the final months of La Niña years and the initial months of the following year, while other areas are affected by dry conditions during the first months of El Niño years, as well as during the summers and autumns of the following year (Muñoz-Diaz and Rodrigo, 2005; Vicente-Serrano, 2005).

Here we explore the possibility that nitrate concentration in the Llobregat River (North-eastern Spain) is influenced by ENSO events, which are modulating precipitation variability over the Western Mediterranean basin. The Southern Oscillation Index during La Niña years, the self-calibrating Palmer Hydrological Drought Index (van der Schrier et al., 2006; Wells et al., 2004), and nitrate concentrations were significantly correlated on a seasonal basis in the Llobregat River, with both drought and nitrate concentrations increasing during positive ENSO phases. Our hypothesis is that initially unusual within-stream nitrate increases would take place, owing to higher-than-normal evaporation from the river. During drought periods, the hydrological deficit favours nitrate accumulation in the catchment's soils and, thus, a decline in allochthonous inputs to the river water would be expectable. Besides, on the late summer and during autumn, nitrates concentration should begin to decrease, though there are high nitrates' allochthonous inputs related to the first heavy precipitation events over the catchment, which return nitrate's peaks in the river.

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