

The North Atlantic Oscillation and the Arctic Oscillation favour harmful algal blooms in SW Europe

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The ecological factors driving the occurrence of harmful algal blooms (HAB) have been traditionally analysed from a hydrological point of view, whereas the interplay between atmospheric oscillations and HAB has been scarcely explored. Here we address the possible link between atmospheric oscillations in SW Europe, using as proxies the North Atlantic Oscillation (NAO) and the Arctic Oscillation (AO) indices and the interannual variability in HAB. The yearly series (1973-2005) of mortality of water birds and fish in Doñana National Park (SW Spain) due to toxins associated with the cyanobacterium *Microcystis aeruginosa*, and the monthly incidence (January 1999 to December 2007) of the paralytic shellfish poisoning (PSP) toxin produced by the dinoflagellate *Gymnodinium catenatum* in the Rías Baixas (NW Spain), were selected as models of HAB in SW Europe. The incidences of both toxic algal events were fitted to a binary logistic regression as a function of the atmospheric oscillation indices (with different delays in accordance with each toxic event) and a favourability function was then computed. The favourability for the wildlife mortality in Doñana National Park was as a function of the AO averaged for the summer period (June-August) whereas the favourability for the incidence of PSP in the Rías Baixas was a function of the NAO recorded 1 month before the event. Since HAB have a relevant impact on ecosystems and human health, there is great interest in deciphering the ecological conditions favouring these events. Here we show that the atmospheric oscillations could be drivers of ecological processes linked to the occurrence of

HAB in SW Europe. Moreover, the favourability functions relating NAO and AO indices with algal toxic events in SW Europe could be used as a powerful tool to predict toxic events. © 2014 Elsevier

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Arctic oscillation

Cyanobacteria

Dinoflagellates

Gymnodinium catenatum

Microcystis aeruginosa

North Atlantic Oscillation

algae

Cyanobacteria

Dinophyceae

Gymnodinium catenatum

Microcystis aeruginosa