Influence of climate variability on estuarine freshwater input across Western Europe: first insights toward the prediction of estuarine physical parameters

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Understanding multi-annual to decadal atmospheric climate controls on winter river discharge is critical to predict the hydrological and ecological functioning of rivers and estuaries, and to assess hydrological hazards. In this work, we examine the relationship between climate and streamflow variabilities in Western Europe through all the dominant climate indices in this region. Analysis of 60-year time-series of winter-averaged river discharge recorded close to the estuarine region of 18 major rivers shows a strong correlation with the North Atlantic Oscillation (NAO) at the southern and far-north latitudes, and with the West Europe Pressure Anomaly (WEPA) at the middle and northern latitudes (from 42ºN to 55ºN). Compared to other dominant indices, NAO and WEPA also show a stronger correlation with winter precipitation in these regions, up to 180% higher than the best of all the other indices in the case of WEPA. The positive phase of WEPA reflects southward shifted and intensified Icelandic Low / Azores High dipole bringing wetter winters at these latitudes. The season-ahead forecasting of these indices could help to understand and predict hydrological risks but also the variability of physico-chemical parameters affected by river discharge. Preliminary results on the good correlation between WEPA and inter-annual salinity and turbidity variabilities in a macrotidal estuary provides first insight toward the prediction of key estuarine properties.

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