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North American river flow as a harbinger of European river flow: Exploring trans-Atlantic hydroclimatological teleconnections

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Improving the prediction of river flow variation is a major scientific challenge of clear societal relevance. The necessity for accurate river flow prediction is made more acute by the need to manage water resources in the face of projected changes in hydrological cycle behaviour and intensified anthropogenic pressure on finite water resources. This paper aims to investigate the potential for prediction of monthly river flow in northern Europe based on North American river flow in preceding months, as a consequence of both hydrological memory and trans-Atlantic teleconnections in the hydroclimatological system.

Statistically significant correlation is found between eastern North American river flow in September and subsequent northern European river flow in October and November. Notably, these trans-Atlantic teleconnections are stronger than the temporal autocorrelation of European river flow. Associated composite analysis of climate fields over northern Europe in the months following North American high and low flow reveal a distinct suite of climate anomalies to be associated with the trans-Atlantic correlation of river flow. These lag-lead hydroclimatic associations can firstly be linked to the autocorrelation of North American river flow from September to October and November, and secondly to previously identified concurrent trans-Atlantic correlation of river flow in October and November. As such, results suggest significant potential for trans-Atlantic river flow prediction.