

Connecting streamflow and atmospheric conditions in Europe: state-of-the-art review and future directions

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Abstract Given the issues of climate change and global water-food-energy security, there is an urgent need to improve understanding of climate–streamflow connections at regional scales and beyond. We synthesise pan-European studies: (1) to evaluate current methods for assessing space–time dynamics for different streamflow metrics (annual regimes, low flows and high flows) and for linking flow variability to atmospheric drivers (circulation indices, air-masses, gridded climate fields and vapour flux); and (2) to propose a plan for future research connecting streamflow and the atmospheric conditions in Europe and elsewhere. We highlight the need to consider appropriate atmospheric descriptors (dependent on the target flow metric and region of interest) and to develop analytical techniques that best characterise connections in the ocean–atmosphere–land surface process chain. We call for the need to consider not only atmospheric interactions, but also the role of the river basin-scale terrestrial hydrological processes in modifying the climate signal response of flows.

Key words hydroclimatology; climate; river discharge; regimes; flood; drought; vapour flux; teleconnections