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Climate is changing, everything is flowing, stationarity is immortal

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There is no doubt that climate is changing—and ever has been. The environment is also changing and in the last decades, as a result of demographic change and technological advancement, environmental change has been accelerating. These affect also the hydrological processes, whose changes in connection with rapidly changing human systems have been the focus of the new scientific decade 2013–2022 of the International Association of Hydrological Sciences, entitled "Panta Rhei – Everything Flows". In view of the changing systems, it has recently suggested that, when dealing with water management and hydrological extremes, stationarity is no longer a proper assumption. Hence, it was proposed that hydrological processes should be treated as nonstationary. Two main reasons contributed to this perception. First, the climate models project a future hydroclimate that will be different from the current one. Second, as streamflow record become longer, they indicate the presence of upward or downward trends. However, till now hydroclimatic projections made in the recent past have not been verified. At the same time, evidence from quite longer records, instrumental or proxy, suggest that local trends are omnipresent but not monotonic; rather at some time upward trends turn to downward ones and vice versa. These observations suggest that improvident dismiss of stationarity and adoption of nonstationary descriptions based either on climate model outputs or observed trends may entail risks. The risks stem from the facts that the future can be different from what was deterministically projected, that deterministic projections are associated with an illusion of decreased uncertainty, as well as that nonstationary models fitted on observed data may have lower predictive capacity than simpler stationary ones. In most of the cases, what is actually needed is to revisit the concept of stationarity and try to apply it carefully, making it consistent with the presence of local trends, possibly incorporating information from deterministic predictions, whenever these prove to be reliable, and estimating the total predictive uncertainty.