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Improving seasonal forecast through the state of large-scale climate signals

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Increasingly uncertain hydrologic regimes are challenging water systems management worldwide, emphasizing the need of accurate medium- to long-term predictions to timely prompt anticipatory operations. In fact, forecasts are usually skillful over short lead time (from hours to days), but predictability tends to decrease on longer lead times. The forecast lead time might be extended by using climate teleconnection, such as El Nino Southern Oscillation (ENSO). Despite the ENSO teleconnection is well defined in some locations such as Western USA and Australia, there is no consensus on how it can be detected and used in other river basins, particularly in Europe, Africa, and Asia. In this work, we propose the use of the Nino Index Phase Analysis for capturing the state of multiple large-scale climate signals (i.e. ENSO, North Atlantic Oscillation, Pacific Decadal Oscillation, Atlantic Multidecadal Oscillation, Dipole Mode Index). This climate state information is used for distinguishing the different phases of the climate signals and for identifying relevant teleconnections between the observations of Sea Surface Temperature (SST) that mostly influence the local hydrologic conditions. The framework is applied to the Lake Como system, a regulated lake in northern Italy which is mainly operated for flood control and irrigation supply. Preliminary results show high correlations between SST and three to six months ahead precipitation in the Lake Como basin. This forecast represents a valuable information to partially anticipate the summer water availability, ultimately supporting the improvement of the Lake Como operations.