

## **Assessing the sensitivity of an Alpine reservoir to hydrological change and improving its operation by adaptive optimization**

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**Abstract** The “scenario-based” approach traditionally used in planning and management of water systems can fail to cope with the non-stationary nature of hydro-climatic conditions and the deep uncertainty in their prediction. In this paper, we contribute to the development of new analytical tools for reservoir management, and specifically for: (i) assessing the sensitivity of water resource systems to hydrological changes; (ii) increasing the adaptation capacity of reservoir systems by adaptive optimization. We use the multipurpose regulated Lake Maggiore, at the border between Switzerland and Italy, as a case study. The application of trend detection techniques shows that significant hydrological changes are already undergoing in the investigated watershed. Historical time series can thus be exploited as a testing ground of adaptation strategies, for instance adaptive optimization of the lake operating policy. Simulation results show that the adaptive approach improves the system performances with respect to the scenario-based one in terms of irrigation supply, while it performs slightly worse for flood control.

**Key words** water resources management; climate change; adaptation; trend analysis