H53C-1107 A Decision Support System for Optimizing Water Consumption between Agriculture and Environment: An Integrated Water Resources Management Approach in the Urmia Lake Basin, Iran

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13:40 - 17:30
Hall B-C (Poster Hall) (Convention Center)

Abstract

Water scarcity, driven by fluctuations in supply and demand, climate change, and surges in population is a daunting challenge with far-reaching implications for society. This issue is particularly critical in arid and semi-arid climates, especially within the agricultural sector. The escalating demand for food has triggered a surge in irrigated cropping systems. In response to these multifaceted challenges, this study focuses on developing a *daily* water allocation system for the Urmia Lake (UL) Basin in Iran, an internationally registered protected area as both an UNESCO Biosphere Reserve and a Ramsar site, which has faced a significant drop in water levels and severe drought in recent years.

By incorporating physically-based hydrological modeling, this study develops a Decision Support System (DSS) for irrigated agricultural zones. In tandem with a previously developed streamflow forecast system, our DSS enables the implementation of an inflow forecast system to predict potential shifts in water allocation across various sectors, encompassing several primary scenarios (e.g., deficit irrigation, crop change, and dynamic environmental water release) and their combinations. The implementation of water allocation scenarios enhances water efficiency in agriculture to ensure the financial stability of local farmers and address the urgent need to prevent further reduction and salinization of UL by maximizing water inflow to the lake. To calibrate and validate the hydrological model and optimize water consumption scenarios, we applied the Multi-Objective Particle Swarm Optimization (MOPSO) and the Multi-Objective Evolutionary

Algorithm based on Decomposition (MOEA/D), respectively. Their lower data demands, ability to handle spatial heterogeneity, and flexibility in representing various hydrologic processes make them preferable for regions with diverse topography, and rainfall patterns. The results suggest that by applying different scenarios, we can increase water inflow to the lake by 30% while simultaneously boosting agricultural profits by 20%. The developed method enables decision-makers and stakeholders to make informed decisions regarding irrigation scenarios and water release.

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