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A water market simulator considering pair-wise trades between agents

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In many basins in England no further water abstraction licences are available. Trading water between water rights holders has been recognized as a potentially effective and economically efficient strategy to mitigate increasing scarcity. A screening tool that could assess the potential for trade through realistic simulation of individual water rights holders would help assess the solution's potential contribution to local water management. We propose an optimisation-driven water market simulator that predicts pair-wise trade in a catchment and represents its interaction with natural hydrology and engineered infrastructure. A model is used to emulate licence-holders' willingness to engage in short-term trade transactions. In their simplest form agents are represented using an economic benefit function. The working hypothesis is that trading behaviour can be partially predicted based on differences in marginal values of water over space and time and estimates of transaction costs on pair-wise trades. We discuss the further possibility of embedding rules, norms and preferences of the different water user sectors to more realistically represent the behaviours, motives and constraints of individual licence holders. The potential benefits and limitations of such a social simulation (agent-based) approach is contrasted with our simulator where agents are driven by economic optimization. A case study based on the Dove River Basin (UK) demonstrates model inputs and outputs. The ability of the model to suggest impacts of water rights policy reforms on trading is discussed.