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Flood mitigation through optimal control of a network of multi-purpose reservoirs by using Model Predictive Control

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Flooding is a common natural disaster in the world. Construction of reservoirs, sluice gates, dikes, embankments and sea walls are implemented to minimize loss of life and property in a flood event. Rather than completely relying on large structural measures, non-structural measures such as real time control of a reservoir system can also improve flood prevention and water supply in a river basin. In this paper, we present the optimal operation of a multi-reservoir system by using Model Predictive Control (MPC) and particular attention is focused on flood mitigation of the Sittaung River Basin, Myanmar. The main challenges are non-linearity in the dynamic behavior of the water system and exponential growth of computational complexity with the state and control dimension. To deal with an issue related to non-linearity, we applied simplified internal model based on linearization scheme with a large grid length. For solving curse of dimensionality, we utilize the reduced model in which the states of the system are reduced by considering outflows from uncontrolled catchments as disturbances in the water system. We also address the computational time for real time control by using large time step scheme. Simulation results indicate that this model is able to use for real time control of a reservoir system addressing trade-offs between the multiple objectives.