Geophysical Research Abstracts
Vol. 17, EGU2015-13978-1, 2015
EGU General Assembly 2015

Incorporating routing into reservoir planning optimization models

Nicholas Zmijewski (1), Anders Wörman (1), and Andrea Bottacin-Busolin (2)

(1) Division of River Engineering, Royal Institute of Technology, Stockholm, Sweden, (2) School of Mechanical, Aerospace and Civil Engineering, University of Manchester, Manchester, M13 9PL, UK

To achieve the best overall operation result in a reservoir network, optimization models are used. For larger reservoir networks the computational cost increases, making simplification of the hydrodynamic description necessary. In-accuracy in flow prediction can be related to an incurred sub-optimality in production planning. Flow behavior in a management optimization model is often described using a constant time-lag model. A simplified hydraulic model was used, describing the stream flow in a reservoir network for short term production planning of a case-study reservoir network (Dalälven River). In this study, the importance of incorporating hydrodynamic wave diffusion for optimized hydropower production planning in a regulated water system was examined, comparing the kinematic-wave model to the constant time-lag. The receding horizon optimization procedure was applied, emulating the data-assimilation procedure present in modern operations. Power production was shown to deviate from the planned production while considering a single time-lag, as a function of the stream description. The simplification of using a constant time-lag could be considered acceptable for streams characterized by high Peclet number. Examining the effect of the effect of the length of the decision time-step demonstrated the importance of high frequency data assimilation for streams characterized by low Peclet numbers. Further, it was shown that the variability in flow becomes more ordered as a result of management and that the Peclet number contributes to that goal.