Geophysical Research Abstracts
Vol. 14, EGU2012-11928-1, 2012
EGU General Assembly 2012

Improved reservoir operation by direct use of hydro-meteorological information

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It is generally agreed that more information translates into better decisions. For instance, the availability of inflow predictions can improve reservoir operation; soil moisture data can be exploited to increase irrigation efficiency; etc. However, beyond this general statement, many theoretical and practical questions remain open. Provided that not all information sources are equally relevant, how does their value depend on the physical features of the water system and on the purposes of the system operation? What is the minimum lead time needed for anticipatory management to be effective? Is the data-predictions-decision paradigm truly effective or would it be better to directly use hydroclimatic data to take optimal decisions, skipping the intermediate step of hydrological forecasting? In this work we investigate these issues by application to the management of a complex water system in Northern Vietnam, characterized by multiple, conflicting objectives including hydropower production, flood control and water supply. First, we quantify the value of hydroclimatic information as the improvement in the system performances that could be attained under the (ideal) assumption of perfect knowledge of all future meteorological and hydrological input. Then, we assess and compare the relevance of different candidate information (meteorological or hydrological observations; ground or remote data; etc.) for the purpose of system operation by novel Input Variable Selection techniques. Finally, we evaluate the performance improvement made possible by the direct use of such information in re-designing the system operation.