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Hydrology and Earth System Sciences Discussions

Interactive comment on "Agricultural-to-hydropower water transfers: sharing water and benefits in hydropower-irrigation systems" *by* A. Tilmant et al.

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We would like to thank reviewer #3 for his/her comments.

1.Dynamically managing water resources in a river basin consists in continuously adjusting allocation decisions based on the status of the system, which is represented here by the inflows and the storage levels in the reservoirs at the beginning of each time period (month).

With the static allocation approach, irrigation withdrawals are essentially independent

of the status of the water resources system, meaning that irrigation water rights are met as long as there is enough water in the system.

Another reviewer has a similar comment. The terms"dynamic" and "static" management/allocation are now directly defined in the abstract.

2.We have reorganized section two around the two-step procedure. We now have:

Section 2. Material and method

Subsection 2-1. Sharing water and benefits: a two-step approach

Subsection 2-2. Stochastic dual dynamic programming

Subsection 2-3. Financial compensation

Subsection 2-4. The Euphrates river in Turkey and Syria

3.Hydrologic uncertainty is generated directly inside the model through a built-in periodic autoregressive (PAR) model of order p that preserves the statistical properties of historical flows. That model generates inflow branches in the scenario tree in order to derive the approximation of the future benefit function through the so-called aggregated approach. For a complete description of the algorithm the reader should refer to:

- Tilmant, A., and R. Kelman (2007), A stochastic approach to analyze trade-offs and risks associated with large-scale water resources systems, Water Resour. Res., 43, W06425, doi:10.1029/2006WR005094

- Tilmant, A., D. Pinte, and Q. Goor (2008), Assessing marginal water values in multipurpose multireservoir systems via stochastic programming, Water Resour. Res., 44, W12431, doi:10.1029/2008WR007024

4.Similar SDDP models are used in the hydropower sector, both for planning and operational purposes. In fact, system operators determine the short term scheduling decisions the next day or week, (usually in hourly time steps) with tools that are specialized in solving unit commitment and transmission constraints. These short-term scheduling tools use the future benefit functions derived from long-term (planning) models as boundary conditions to provide the correct incentives for storing water for future use. Short-term models are often coupled to a SCADA and/or a database, and are automatically updated and run. The current version of the model only relies on the PAR hydrologic model to provide a probabilistic description of future flows. Forecasts (real-time/seasonal) are not (yet) assimilated.

5.At-source water value = value of water in a stream or a lake. At-site water value = value of water at the site of use (farm, factory, home). At-site value exceeds the at-source value by whatever costs and losses are required to store, transport, treat and distribute water.

6.The samples come from the simulation phase of the optimization algorithm: the system is simulated with 50 different hydrologic sequences (scenarios). Hence, for each site (reservoir, abstraction) and for each time period (month), we get 50-dimensional vectors of allocation decisions (release, withdrawals, storage). We have removed Table 3 but kept Table 2 as it is because we find it not very clear once replaced by text.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 2041, 2009.