

Interactive comment on “Simulating long-term past changes in the balance between water demand and availability and assessing their main drivers at the river basin management scale” by J. Fabre et al.

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Referee's report, HESS, manuscript no. hess-2014-431 Paper title: Simulating long-term past changes in the balance between water demand and availability and assessing their main drivers at the river basin management scale Authors: J. Fabre, D. Rueland, A. Dezetter and B. Grouillet

General comments:

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There are several global water models which are applied to simulate water availability and water demand on a large scale (on a country base or for large river basins). Although they deliver an assessment of the balance between water demand and availability on the large scale, their spatial resolution is too coarse, and the underlying data are not detailed enough to represent processes and developments on the hydrological mesoscale. So far, respective studies which could fill this gap were scarce, but the study presented in this paper is a very valuable contribution of such a mesoscale investigation. The two investigated basins are representative examples for Mediterranean conditions which are increasingly affected by a combination of rising water demands (e.g., through increasing agricultural irrigation or water demand from tourist centres) and the effects of strong climate variability and climate change which adversely modify the availability of natural water resources. The authors developed a very detailed approach to include the most important drivers and parameters which control human water demand (including urban, agricultural and other water demands) for the two selected catchments. They interviewed relevant stakeholders regarding the driving forces of water demand, the decisions to allocate available water resources and even tried their best to represent dam management as realistic as possible. Although the study still includes a variety of assumptions and shows several shortcomings (for example with respect to the spatial resolution of the meteorological input parameters), one should however regard the (successful) attempt to develop an integrative modelling framework which is able to represent water stress on the mesoscale and to distinguish anthropogenic impacts on streamflow variability from the impact of climate variability. Moreover, the authors have their own critical look on their study (see Discussion and Limitations sections of the paper), i.e., they always keep a realistic view, and they anticipate any critical questions from the reviewer. To conclude, the paper is a valuable contribution to the ongoing discussion how climate variability and change will – in combination with socio-economic changes – modify water stress on the mesoscale. I am sure that the presented approach could be (in a modified and further developed way) applied in different environmental and anthropogenic settings. Eventually, one should

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also highlight the excellent figures and graphical representations in the manuscript.

Specific comments

- the length of the paper's title appears inadequate and reads complicated; therefore, it is recommended to shorten the title
- the frequently used term "hydrosystems" sounds a bit technical and is not well defined, it could therefore be confused with another meaning
- the Introduction gives a relevant overview of global and regional studies with regard to investigations dealing with anthropogenic drivers and climate change and how they affect water availability and water demand and the balance between the two. Maybe it is a subjective impression of the reviewer, but this section reads not very well, it appears to be overloaded with a variety of specific expressions which hinder a smooth flow in reading. Maybe it could be smoothed through the reduction of some cumbersome expressions?
- could you please briefly explain (in the Introduction) why you selected the Ebro and Herault basins for your study? Regarding the selection of the Ebro it is maybe more understandable to the reader, but the Herault basin is quite unknown among international readers, and its size is very different from that of the Ebro
- climate forcings for the modelling setup (section 2.2): the meteorological input appears to be quite coarse information (8 x 8 km grid), especially with respect of the total area of the Herault basin. Don't you think that a finer spatial grid would better represent the spatial meteorological characteristics of the catchments and thus lead to more reliable modelling results?
- why did you calculate potential evapotranspiration instead of actual evapotranspiration? Do you think it is realistic to apply two quite different formulae to calculate potential evapotranspiration in the two basins? Did you apply both formulae for one basin in order to assess the bias? I think that the Hargreaves formula as presented

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in equation (1) is an extreme simplification of the evaporation processes (e.g., factor 0.0023 in "windy areas")

- Equation (1): what is MOY?
- Section 5.3: please add a web link of the GICC-REMedHE project
- could you please state (in your response to the reviewers comments) what is different in this paper with regard to the previous papers you and your colleagues published earlier, especially the articles of Collet et al. (2013), Collet et al. (2014), as well as the papers of Milano et al. cited in your manuscript? What is substantially new in this manuscript?

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