Hydrol. Earth Syst. Sci. Discuss., 12, C5912–C5917, 2016
www.hydrol-earth-syst-sci-discuss.net/12/C5912/2016/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Hierarchy of climate and hydrological uncertainties in transient low flow projections" *by* J.-P. Vidal et al.

Anonymous Referee #1

Received and published: 4 January 2016

The paper proposes a methodology to estimate a transient probability distribution of yearly hydrological variables conditional to ensemble projections. Specifically, yearly anomalies and rolling means over 30 years of anomalies of MAM7 are analysed. The projections are derived from a model chain involving GCMs, statistical downscaling methods and hydrological models and the contribution of each model chain member to total uncertainty is quantified using quasi-ergodic analysis of variance.

General comments

The authors investigate the relevant topic of future changes to low flow behavior and makes use of transient projections which is important for water management for specific years. The paper is generally well written and provides relevant and timely references. It also presents clear figures to support their statements. However, I see some points

that need to be addressed before I feel confident in recommending final publication:

1. Since projections are used on hydrological models I miss the description on how these models were tested on robustness. If a hydrological model is not robust - in this case particularly targeting low flow-, I do not trust indications that are made with projections, i.e. in changed conditions. See for instance the simple recommendations made by Klemeš (1986).
2. The paper reads nicely and logic until the discussion starts. Here there are many parts that actually would belong to the Methods and Results sections. Please, restructure for better readability of the entire paper. (See also Specific comments)
3. The authors introduce convincingly the benefit of transient projections. Hence, I would expect a discussion on this benefit underlined with the results that are presented as well as concrete examples for application. Particularly, the time of emergence and related uncertainties are not discussed (see also Specific comments).

Specific comments

- 12652L20 Does the reference present the low number or does it propose alternatives? (not clear from its placement); name these alternatives briefly
- 12653L5 why is it called comprehensive, briefly state why
- 12654L17 does the higher elevated catchment contain glacierized parts?
- 12654L21-L25 I wonder if these reconstitutions and their related uncertainties could influence the outcomes of the uncertainty contribution partitioning. Please, clarify.

- 12655L16ff the basic principle is introduced, but since three different SDMs are used it would be good to briefly introduce the specific differences among them, or earlier refer to Table2
- 12656l12-17 How often and how much was the temperature corrected? –> possible impacts on results? And impacts on the interpretation in 12668L2 “identical”?
- 12657L13 what are the consequences of this initially coupled mode if any?
- 12657L14 Here I miss the description on how the hydrological models were tested on robustness (Klemeš 1986)
- 12657L19 is there a practical motivation for choosing the MAM7 and not any other low flow metric?
- 12658L5 is there snowfall already before November in the higher catchment?
- 12662L13-15 move to Methods
- 12663L23-25 this is Discussion not Results
- 12663L26-27 “, which...” Discussion not Results
- 12664L2-3 “The SDM contribution...” Discussion not Results
- 12664L20 -12665L2 Methods not Results
- 12665L26 -12666L2 Methods not Results – also I find this Time of Emergence very appealing and would appreciate more details and thoughts on applicability on it
- 12666L6 -12666L17 contains parts that belong to discussion rather than Results
- 12667L4 - 12667L14 Methods not Discussion

- 12667L14 - 12667L21 Results not Discussion
- 12669L4 -12669L24 Methods and Results not Discussion
- 12669L26-28 actually, less snow pack can have two natural reasons related to precipitation: 1) less precipitation fell in general or 2) precipitation fell as rain; these two would have different effects and would not necessarily result in more water for winter low flow
- 12671L13 I would appreciate a discussion on the time of Emergence and its relevance for application respectively the limitations that are related to this metric; could it be influenced by the initial calibration for instance?
- L12671L25- 12672L4 the benefit of transient quantification of uncertainties should be discussed before appearing in the conclusions - potentially comparing to other studies that used other than low flow variables and then leading to applicability particularly for the water management with the focus on low flow as pointed at in the conclusions 12672L24f
- 12689 I like this Figure very much!
- 12692 Figure4 Durance@Serre-Ponçon makes me wonder how suitable GCMs in higher Alpine catchments are. ECHAM5 and CNCM33 show opposite signals over the entire period (winter). Could the authors add some words on the suitability of GCMs in high Alpine catchments?

Technical comments

- 12650L8 and L9 “of” –>“for”?
- 12650L12 “possible transient futures” rephrase!

- 12650L16 “most elevated”, only two catchments are studied –> change
- 12650L19-21 Unclear, rephrase
- 12651L20 either “paragraphs propose” or “paragraph proposes” (I guess the latter?)
- 12652L25f reformulate for better understanding
- 12652L26 when –> while
- 12653L1 “possible futures”, please change to “future possibilities” or similar
- 12653L5 move 1980-2065 after hydrological projections
- 12653L12 verb missing after critically
- 12655L7 add “the” before year
- 12655L9 that –> these GCM runs
- 12655L10 runs –> is
- 12656L1 predictors
- 12659L5 NFS would mean N* F* S mathematically speaking, please change to S_{NF} or similar throughout
- 12661L16 did Hingray and Saïd do the same of did they overfit – not clear from this sentence
- 12668L13 “snowpack building” rephrase
- 12671L27 change “account of” into “into account” and place after “variability”

- 12692 correct to “catchments” in the caption
- 12701 add “the” before year 2065

References

Klemeš, V. 1986. “Operational Testing of Hydrological Simulation Models.” Hydrological Sciences Journal 31 (1): 13–24. doi:10.1080/02626668609491024.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 12649, 2015.