

## ***Interactive comment on “Filling the white space on maps of European runoff trends: estimates from a multi-model ensemble” by K. Stahl et al.***

**K. Stahl et al.**

kerstin.stahl@hydrology.uni-freiburg.de

Received and published: 18 April 2012

We appreciate the referee's valuable suggestions. We are confident that their incorporation will improve the discussion section of the revised manuscript.

1. The aspect of “filling white space” perhaps got a bit lost over the focus on details of the validation of the modeled trends. We suggest to re-focus some of the key text to highlight better the previously unknown trend patterns for the white space that this study revealed through a consistent pan-European approach. We really care about this message (besides the validation) and hence would like to keep the title. Another reason to keep the title is the call for more data sharing it implicitly contains. From past experience we think that there is justified hope that illustrations of being in the white space may be an incentive for some countries to consider the establishment of

C975

a shareable subset of data or derived data. In addition, the suggestion to compile a “composite map” is certainly an interesting approach and indeed our study provides the necessary validation to decide how feasible such a composite construction might be that would use models for the white space, but observations where available. We suggest to improve this discussion also including other options as perhaps the rainfall/radar study mentioned and other analogues of observed and modeling information merging.

2. The WFD has not been validated systematically against independent raingauges at the larger scale as far as we know. However, due to the use of GPCC data in the bias correction, most commonly available stations will have been used in the construction of the WFD and hence cannot be used for independent validation. Some more local studies within the WATCH project have compared the data with local measurements and found a good agreement for monthly values (e.g. Van Huijgevoort et al. 2012; and some unpublished MSc theses). In terms of specific validation for climate trends some information has come from a recent application by Oliveira et al (in review), who suggest that radiation trends are not well represented. However, only some models used the radiation variables of the WFD. In the revised manuscript we will improve the discussion on potential errors in the forcing data trends.

3. We agree that we present a study of the type that Merz et al. classify as ‘only using references for attribution’ and that there is room for improvement of the discussion on potential ways forward towards attribution. We indeed have plans for that and have presented the WFD trends alongside the runoff trends at AGU 2011. However, as the referee and the citations describe, attribution is far from easy and in particular lacks empirical approaches (simply comparing climate and hydrology trends isn't enough). Perhaps as a result of this difficulty, Merz et al. also appear to focus on model-based approaches to attribution. In this respect our validation appears even more important because model experiments can only be used for attribution if they correctly model observed transient changes in the first place.

C976

Response to specific comments:

We appreciated the detailed comments related to clarification and emphasis in the text and will revise the sections as suggested (i.e. remarks p. 2008, 2010, 2011, 2012, 2013, 2016 and technical corrections p. 2011 and Figs 4 and 5).

p. 2010: More detailed information on the catchments (incl. distributions) have been shown previously (e.g. Stahl et al., 2010). However, we can certainly add some more information in the revised version (as also requested by Referee 2). We can also add some more discussion on the scale issue and include references to previous publications where this was discussed.

p. 2013: Fig 1 equivalent for monthly: the problem is that those would be a lot of plots. As box plots the graphs wouldn't be much smaller and 3x12 would take up at least three pages. Even as an Appendix this might be a bit boring information for most readers.

p. 2015: Model-disagreement vs validation-disagreement: We will examine the idea for the revision.

References:

B. Merz, S. Vorogushyn, S. Uhlemann, J. Delgado, and Y. Hundecha, More efforts and scientific rigour are needed to attribute trends in flood time series. *Hydrol. Earth Syst. Sci. Discuss.*, 9, 1345–1365, 2012.

Oliveira P. J. C., Edouard A., Davin L., Orlowsky B., Stahl K., Tallaksen L. M. and Seneviratne Sonia I., Simulated and observed inter-annual variability and trends in European runoff. Submitted to *Journal of Hydrology*.

Stahl, K., Hisdal, H., Hannaford, J., Tallaksen, L. M., van Lanen, H. A. J., Sauquet, E., Demuth, Fendekova, M., and Jordar, J.: Streamflow trends in Europe: evidence from a dataset of near-natural catchments, *Hydrol. Earth Syst. Sci.*, 14, 2367–2382, doi:10.5194/hess-14-2367-2010, 2010.

C977

Van Huijgevoort, M. H. J., Van Loon, A. F., Rakovec, O., Haddeland, I., Horacek, S., and Van Lanen, H. A. J.: Drought assessment using local and large-scale forcing data in small 25 catchments, in: *Global Change: Facing Risks and Threats to Water Resources*, edited by: Servat, E., Demuth, S., Dezetter, A., Daniell, T., Ferrari, E., Ijjaali, M., Jabrane, R., Van Lanen, H., and Huang, Y., IAHS Publ. No. 340, 77–85, 2010.

---

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 9, 2005, 2012.

C978