We thank Dimitris for his useful comments on the paper

Hydrological ensemble prediction systems are of great importance and usefulness, and in this respect an opinion paper about improving them is most welcome. The abstract of the paper by Wetterhall et al. (2013) looks promising in this respect. However, some of the stuff contained in the paper may not be interesting to the hydrological audience as it does not belong to hydrological science and technology. Too much attention is given to procedural issues (related to group meetings, questionnaires, voting, popular TV series) and too little is said about the scientific content of the outcomes of these procedures. I think the procedural issues have an interest from a social point of view but it would be more pertinent to report (and review) them in a more social-sciences oriented journal. Even in the latter, some more scientific analyses would be needed as to explain the choices made in those procedures, the behaviours in the groups, the interpretation of the outcomes, etc. Also, in accord to what the commenter Lepez (2013) says, I too believe that some rigour in this part of the analysis (definition of terms, description of procedures followed in forecast utilization, etc.) would be necessary.

Since the scope of HESS is hydrological, I believe that substantial restructuring of the paper is needed before it can be published in HESS. I believe that most material of the current sections 3 and 4 should be moved to an Appendix to be published as supplementary material. These sections could then be replaced with in depth scientific discussion of the results of the survey.

A: We are not undertaking a behavioural science study. We are merely seeking to understand, communicate and voice our group's **opinion** on this matter as a first step. A more formal social scientific science study would be an excellent next step but will be extremely difficult to implement (see previous projects and reports e.g. on Europeanizing Flood Forecasting http://www.kcl.ac.uk/sspp/departments/geography/research/hrg/projects/EuropeanizingFloodForecasting.aspx for details). This opinion can motivate further studies in this area, You cannot remove "the people" from forecasting science and we firmly believe that the readership would be interested in the content and style of this opinion paper. We believe that decision making and research prioritization in operational hydrological forecasting systems is well within the scope of HESS.

For example, with reference to the five most popular priorities shown in Table 3, what is the meaning, feasibility, implied research directions and science questions, and required effort for the voted priorities? By the way, I believe voting is irrelevant in scientific affairs. Is it a matter of voting for, say, a priority to "Increase the average skill of the medium range forecast (> 3 days)" in order to materialize it? What are the scientific obstacles that have not allowed a good skill for medium range forecasts and how feasible it is to overcome them? What does it mean, in scientific terms, to "Improve physical model representations" and how does this relate to the end-user perception?

A: Voting is however not irrelevant in operational hydrological forecasting which has to balance limited resources, incomplete data and knowledge with the deep desire to provide a valuable service. This opinion is NOT about scientific priorities or limitations but about forecasters priorities - we do of course not diminish the importance of science in improving forecasting. Scientific obstacles are a consideration and for example included in figure 3. Improvement of physical model representation is a header for various processes such as the inclusion of ice jams (see reposne to Thorsten) and we will add further examples.

The uncertainty, as an essential and inevitable characteristic intrinsic to the notion of forecast is not covered in full. For this issue, the authors may wish to refer to Montanari and Koutsoyiannis (2012) and the references therein, as well as Ntelekos et al. (2006) and Villarini et al. (2010). Discussion of the last two works would also offer the opportunity to make some comparisons with the American Flash Flood Guidance System.

A: Forecasting is a process in which we are trying to reduce uncertainty about the future . It is intrinsic part of any Hydrological Ensemble forecasting system. However, it is just one (although an important one) aspect of a forecasting system and chain. This type of discussion and analysis is provided elsewhere in the literature on Hydrological Ensemble systems. The interesting paper by Montanari and Koutsoyiannison, 2012, "*A blueprint for process-based modelling of uncertain hydrological systems*" is a scientific technical discussion which omits the view point of end-users, decision makers or forecasters. We do not understand why it has to be covered in full as this is not the focus of this opinion paper. Hydrological Ensemble forecasting and the inhereent uncertainty is at the core of the discussed system and other similar forecasting systems. Representation and treatment of uncertainty is discussed in detail for example in the area of post-processing by Ramos et al. 2013a (amongst publications). We will clarify this in the revisions.

The probabilistic flash flood guidance system described in these papers is an extremely interesting scientific development but to our knowledge not operational (there is one pre-operational probabilistic flash flood forecasting system, which is of similar nature to the quoted paper, but slightly different see Coscrove et al., 2012, "Overview and initial evaluation ... ", NOAA technical report NWS 54 - http://docs.lib.noaa.gov/noaa_documents/NWS/TR_NWS/TR_NWS_54.pdf - for other similar systems visit http://hepex.irstea.fr/operational-heps-systems-around-the-globe/).

This nicely illustrates the importance of engaging with forecasters and understanding their priorities justifying this opinion. The excellent paper by Ntelekos et al discusses the technical development of a probabilistic guidance system. They state "*The current system used by the U.S. National Weather Service (NWS) to issue flash-flood warnings and watches over the Unites States is a purely deterministic system. The authors propose a simple approach to augment the Flash Flood Guidance System (FFGS) with uncertainty propagation components*.". The paper does not incorporate the wishes, preferences, legal/institutional requirements or priorities of the forecasters. It also does not discuss any details of the engagement process. It cannot be used for a comparison with the focus of this paper. The same is valid for Villarini et al. which is again an excellent paper and involves some interesting cost-loss decision making analysis (worth reading). The analysis of the latter illustrates the difference in objectives of these papers as Villarini et al. clearly do not focus on forecasters and their opinions. They state that "*[they] also assume that the "cost" associated with false alarms and missed warnings was previously quantified*".
Indeed if the reviewer is interested in this type of comparison we direct his attention to for example the experiment on "*Intercomparison of streamflow post-processors*" (see http://hepex.irstea.fr/intercomparison-of-streamflow-post-processors-post-processing-hydrologic-model-simulations-phase-1/).

Ramos, M.H., Verkade, J.,Voisin, N. "HEPEX-SIP Topic: Post-processing (1/3)," HEPEX, May 2, 2013a, http://hepex.irstea.fr/hepex-sip-topic-post-processing-13

Another possible direction for expanding the analysis and making it more explanatory would be to include some case studies or examples. Directions to this end have been offered by reviewer Wagener (2013), e.g.: “Could you include some examples where existing forecasts fail? Are there examples of the kind of decision-making tools that you would use?”

A: We will not include case studies as they would distract from the focus of a system providing continuous forecasts. As soon as one represents a case study it becomes about this example, which will always only be limiting in reflecting most of the forecasters opinions. We will provide example sin terms of processes as described in our response to Thorsten.

REFERENCES

Montanari, A., and Koutsoyiannis, D.: A blueprint for process-based modelling of uncertain hydrological systems, Water Resources Research, 48, W09555, doi: 10.1029/2011WR011412, 2012.

Ntelekos, A. A., Georgakakos, K. P., and Krajewski, W. F.: On the uncertainties of flash flood guidance: Toward probabilistic forecasting of flash floods, Journal of Hydrometeorology, 7(5), 896-915, 2006.

Stephens, E. M.: Interactive comment on “Forecasters priorities for improving probabilistic flood forecasts” by F. Wetterhall et al., Hydrol. Earth Syst. Sci. Discuss., 10,

Villarini, G., Krajewski, W. F., Ntelekos, A. A., Georgakakos, K. P., and Smith, J. A.: Towards probabilistic forecasting of flash floods: The combined effects of uncertainty in radar-rainfall and flash flood guidance, Journal of Hydrology, 394(1), 275-284, 2010.

Wagener, T.: Interactive comment on “Forecasters priorities for improving probabilistic flood forecasts” by F. Wetterhall et al., Hydrol. Earth Syst. Sci. Discuss., Hydrol. Earth Syst. Sci. Discuss., 10, C1056–C1057, 2013.

Wetterhall, F., Pappenberger, F., Cloke, H. L., Thielen-del Pozo, J., Balabanova, S., Daˇnhelka, J., Vogelbacher, A., Salamon, P., Carrasco, I., Cabrera-Tordera, A. J., Corzo-Toscano, M., Garcia-Padilla, M., Garcia-Sanchez, R. J., Ardilouze, C., Jurela, S., Terek, B., Csik, A., Casey, J., StankÅ´naviˇcius, G., Ceres, V., Sprokkereef, E., Stam, J., Anghel, E., Vladikovic, D., Alionte Eklund, C., Hjerdt, N., Djerv, H., Holmberg, F., Nilsson, J., Nyström, K., Sušnik, M., Hazlinger, M., and Holubecka, M.: Forecasters priorities for improving probabilistic flood forecasts, Hydrol. Earth Syst. Sci. Discuss., 10,