Hydrology and Earth System Sciences Discussions

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Interactive comment on "The European Flood Alert System EFAS – Part 2: Statistical skill assessment of probabilistic and deterministic operational forecasts" *by* J. C. Bartholmes et al.

J. C. Bartholmes et al.

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We would like to thank the Reviewer for providing a valuable and exciting discussion of our paper, which allows us to further clarify the aims of our article and the choice of statistical tools to evaluate EFAS forecasts.

We fully agree that the reduction of "probabilistic predictions to a binary sequence of exceedances necessarily implies a great loss of information", and we also expressed this concern when describing the methodology applied (page 295, lines 5-7): "EFAS forecasts analysed here contain only information if a forecasted discharge in a pixel is above or below a certain threshold". We actually consider that the use of such an approach would be wrong if one wanted to evaluate the skill of a forecasting system in

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respect to the full probability distribution of discharges. That, however, is not the aim of our paper, since, additionally, the aim of the EFAS medium range forecasting system, on which our study is based, is not to provide the probability density function of forecasted discharges at a point in a river, but rather to provide the forecasted probability of exceeding a given critical discharge threshold, given that an ensemble of possible weather scenarios is given. Therefore, we challenge the statement that any information is lost in respect to the aims of EFAS.

The aims of EFAS are clearly specified in Part I of this paper (Thielen et al., 2008) and reminded to the reader on page 295, lines 12-13 of our paper. The system is designed to provide an early warning system of "flood forecasting information from 3 to 10 days in advance". It does not want to (and, actually, cannot) provide quantitative discharge predictions for the assessment of the probabilistic distribution of forecasted discharges. This is not possible for many reasons as, for instance, the current quality of NWPs at lead times greater than 3 days and the poor availability of real-time observed discharges for forecast updating on European scale. EFAS early flood warning system is targeted to the stage previous to the quantitative prediction of discharge curves, which is, in fact, successively provided by the user community of EFAS (the national hydro-meteorological forecasting centres). It incorporates uncertain probabilistic forecast into the theoretic framework of a decision support system leading to binary decisions such as: will the discharge get over a critical threshold or not? what is the probability that the discharge gets over a critical threshold? These aspects are presented in detail in Part I (Thielen et al., 2008). In our study on the skill assessment of EFAS forecasts, as stated in the conclusion section (page 307, lines 19-21), we only expect "to give the forecaster the possibility to assess past performance of the system at any time and to give guidance to the forecaster in estimating the forecast probability of an event to happen"; an event being here understood as the exceedance of a critical flood threshold (as stated on 3.1 Variable analysed, page 295). Our aim is stated on page 292 (line 27) and consists of analysing the past performance of EFAS forecasts, i.e., EFAS forecasted exceedances of critical flood thresholds for pre-warning (3 to 10

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days in advance).

Concerning the statistical tools applied for forecast evaluation, the common skill scores that we used for our work are based on contingency tables made of dichotomous events. These evaluation tools thus necessitate the use of thresholds and are appropriate to the kind of forecasts provided by EFAS. We used as well a skill score that in meteorology is used as the probabilistic skill score "per se": the Brier Skill Score which is also based on a threshold exceedance approach.

The Reviewer stated that "operational value of a prediction can be performed through i) the expected costs associated to the predicted distribution and ii) a cost/loss ratio modeling the risk acceptance". In general, we also completely agree with this statement. The leading author of this paper has worked on this subject (see references) and, in the EFAS project, the usefulness of EFAS medium-range forecasts is discussed in other publications (Buizza et al., 2007; Thielen and Ramos, 2006). In this paper, we focused on the quality of EFAS operational forecasts (threshold exceedances). The cost/loss evaluation is undoubtedly an interesting topic for future research, although one must have in mind that it would imply that significant (and meaningful) information for this kind of assessment exists. To our knowledge, there is no such data base containing information of adequate resolution (5x5 km2) on a pan-European scale.

Finally, we thank the reviewer for contributing to the discussion and for the reference indicated in the review. We apologize for any lack of clearness in the paragraph "3.1 Variable analysed: the threshold exceedance". We explicitly referred therein to the 'sister'- paper by Thielen et al. (2008, please see references) in which the approach is described in full detail and expected that the definition of a "forecast event" and our choice of forecast verification tools would then be rightly understood. We will modify this section in the revised version to make it more straightforward understandable.

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