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Hydrology and Earth System Sciences Discussions

Interactive comment on "Rainfall nowcasting by at site stochastic model P.R.A.I.S.E." *by* B. Sirangelo et al.

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The paper presents PRAISE stochastic model of hourly rainfall depth and demonstrates application of the model to at site real-time rainfall forecast in Southern Italy. The model is based on the construction of joint probability distribution of the forecasted rainfall depth and the predicting random variable; the latter is assumed to be a linear function of the antecedent rainfall depths. Theoretical basis of PRAISE model is described in detail and method for estimating the model parameters is presented. An ability of the model for estimation of statistical confidence limits of the forecasted hourly rainfall depth and comparison of these limits with the recorded rainfall depth are shown.

Overall, this is an interesting paper which deals with one of the topical problems of hydrometeorology, namely, quantitative rainfall forecast. The subject of the paper lies

within the score of the journal. However there are a few changes I suggest to take into account by the authors before the paper can be accepted for publication in HESS.

1. The presented PRAISE model is based on the hypothesis of weak stationarity of the hourly rainfall depths. This hypothesis seems to be questionable for the described process and the model ability for real-time rainfall forecasting is unobvious without validity of the hypothesis. I believe that the authors had reasons for acceptance of such an assumption and suggest discussing these reasons in the paper.

2. Section 4.1 ("Validation of the model") is presented in a very condensed form and the presented results are deficient to evaluate the model applicability for rainfall forecasting. I would like to ask the authors to clarify some questions. How many rainfall events were used for the model validation? A reader can suggest that the model was validated against more observed rainfall events than two ones illustrated in Figs 5, 6. If that's the case, I suggest estimating and summarizing results of validation by the all tested events. Are the rainfall events utilized for validation test not the same ones as used for the model calibration?

3. Autocorrelation structure of rainfall visibly varies over the region under consideration as it follows from Fig. 2a. However the authors found the constant value (8 hours) of the correlation length for all 104 raingauges of the region. Does it mean that the correlation length is independent on the parameter shown in Fig.2a? Please clarify this. As well, it is rather questionable, that the chosen threshold value (=0.025) of autocorrelation is the maximum statistically insignificant value for all raingauges. In this connection, I do not understand why the authors used the fixed value of partial autocorrelation for estimating the correlation length instead of the usual procedure based on the analysis of the confidence limits of the autocorrelation function. Also, the used term "extension of the memory" seems to me as rather uncertain

4. The estimated values of the parameters, which are shown in Table 3, assumed to be constant values. It may be useful for a reader if the authors show temporary changes

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of the parameters (at least for the Cosenza raingauge) and analysis of statistical significance of these changes. The results of the analysis can be a telling argument in order to show possibility of using hypothesis of stationarity of the hourly rainfall depths (see comment 1). Additionally, I suggest showing standard deviations of the parameter estimations in Table 3.

5. In the “Introduction” the authors proposed objectionable categorization of the existing stochastic precipitation models into following two broad types: autoregressive models and point process model. However the autoregressive models are not an exclusive representative of the discrete-time precipitation models. Therefore I suggest using the term “discrete time-series models” as opposed to the point process models which are continuous time-series models. Some reported references are not related to the specified type of rainfall models, for example, autoregressive rainfall model is not presented in the book Bras & Rodriguez-Iturbe, 1984; I doubt that point process model is described in Katz & Parlange, 1995; please check this. Generally, I suggest to make shorter the list of the references concerning stochastic precipitation models but to give some reviewing publications (e.g. Waymire, E., and V. K. Gupta, The mathematical structure of rainfall representations, 1. A review of the stochastic rainfall models, Water Resour. Res., 17(5), 1261-1272, 1981a. Foufoula-Georgiou, E., and K. P. Georgakakos, Recent advances in space-time precipitation modeling and forecasting, Recent Advances in the Modelling of Hydrologic Systems, NATO ASI Ser. 1988. Georgakakos, K. P., and M. L. Kavvas, Precipitation analysis, modeling and prediction in hydrology, Rev. Geophys., 25(2), 163-178, 1987, etc.).

6. The detailed description of calculation of the partial autocorrelations is excessive, therefore I suggest to cut down this description from the Section 2.1

Concluding Remarks

1. Does the paper address relevant scientific questions within the scope of HESS? YES 2. Does the paper present novel concepts, ideas, tools or data? YES 3. Are

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substantial conclusions reached? NOT COMPLETELY 4. Are the scientific methods and assumptions valid and clearly outlined? NOT COMPLETELY 5. Are the results sufficient to support the interpretations and conclusions? NOT COMPLETELY 6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientific (traceability of results)? NOT COMPLETELY 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? YES 8. Does the title clearly reflect the contents of the paper? YES 9. Does the abstract provide a concise and complete summary? YES 10. Is the overall presentation well structured and clear? YES 11. Is the language fluent and precise? YES 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? YES 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? YES (see comment #6) 14. Are the number and quality of references appropriate? NOT COMPLETELY (see comment #5) 15. Is the amount and quality of supplementary material appropriate? NOT COMPLETELY (see comment #2)

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 151, 2007.