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Interactive comment on "A space-time generator for rainfall nowcasting: the PRAISEST model" *by* P. Versace et al.

P. Versace et al.

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We thank the referee 2 for his comments on our paper. We consider the comments as very useful and below we provide the answers to the questions raised. Reply on the specific comments:

1. We have simplified the mathematical notation, to improve the clarity of the work. Moreover we have introduced, in the revised paper, the expressions referred to the conditional probability densities.

2. We have used portion of the text suggested by the referee, to make more concise the model description.

3. Starting from the joint density is very important to derive the expression of the condi-

tional ones, so we didn't delete this part but we have completed it with the formulations needed for the forecasting.

4. The association parameter between Z and W variables, when they are non zero and H is zero, is important because it appears in the expression of the density g0,W,Z(w,z), used to evaluate the cumulate distribution function (CDF) FH|W,Z(h|w,z), as reported in eq. (16) of the revised paper.

5. In the introduction we solely discuss nowcasting models without a detailed general review of stochastic models (and especially those that are not easily formulated for nowcasting), considering 2 or 3 reference at most for each model.

6. As regards the threshold value for estimating the correlation length, it is evaluated by generation of time series using autoregressive models of order equal to the correlation length, and considering the 95 % confidence interval of the sample maximum absolute scattering. Nevertheless, using autoregressive models appears unsuitable for the rainfall feature, and it cannot be used as statistical test. The coefficients alfa can be estimated by maximization of the coefficient of linear correlation. If ni is large the number of parameters may be too high, then a technique of linear filtering results convenient, like gamma-power function, as the coefficients depend on a reduce number of parameters. The auto-regression (AR) has different parameters for each grid cell, as clearly reported in section, page 760 line 21, in which "the first calibration step, for every cell, is the evaluation of (a, b, c) parameter of the gamma-power function".

7. In the case of high-resolution timestep, for example hourly or sub-hourly, storm advection may be reproduced, in stochastic way, by the correlation structure referred to the spatial neighbourhood approach. Nevertheless, in future work, a deterministic modelling of frontal system will be presented.

8. It is clear that rHZ is the sample linear correlation coefficient between H and Z, and it is reported in the revised paper.

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9. We consider very important to explain the formulation of the weighted average for W variable, depending on correlation coefficient, so we didn't delete it.

10. In the section 2.2, we consider very important the lines 6 to 9 of page 756 and the equations 6-13, so we didn't delete this part but we have completed it with the formulations needed for the forecasting. In the same section we have used part of the text suggested by the referee, and we didn't use alfa and beta as transform parameters because they appear for the autoregression and weighted average. Moreover, equations 19,20, 21 and 23 of the old paper were deleted.

11. As clearly specified in the revised paper, considering equations 13-16, the whole set of 42 parameter must be used for forecasting, because all the density functions, referred to equation 5, are necessary.

12. All the parameters are constant over the time, because they are evaluated under the hypothesis of stationary field, in stochastic sense, referred to the rainy season (October 1st -May 31st; De Luca, 2005), as clearly specified in the following section 5.1 of the paper.

13. The performances of the Implicit scheme are always better then Explicit ones. Consequently the Explicit scheme is not reported in the revised paper.

14. During the forecasting, as Z is a sum of random variables to predict, for evaluating the distribution of it, as noted by statistic theory, a convolution operation may be required. This is the reason for which we use Monte Carlo approach.

15. The PRAISEST Model reproduces autocorrelations and locally spatial correlation by considering the estimated coefficients alfa and beta, under the hypothesis of stationary field, in stochastic sense, referred to the rainy season. Under this hypothesis, also dry ratios, wet-to-dry and dry-to-wet ratios are reproduced, by considering the estimated probabilities pHWZ, pHW0, pH0Z, p0WZ , pH00, p0W0,p00Z and p000, equal to the observed frequencies. These are estimations of Maximum Likelihood.

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16. Referred to the comment for which "from Figures 11 and 12 it does not seem that the model correctly reproduces the portion of dry pixels", we highlight that for each pixel PRAISEST provides a probability function and not a single value.

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