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Interactive comment on “Copula-based statistical refinement of precipitation in RCM simulations over complex terrain” by P. Laux et al.

Anonymous Referee #3

Received and published: 24 May 2011

This manuscript introduces a copula-based approach for downscaling of regional climate models. The subject matter fits the scope of Hydrology and Earth System Sciences and, in my opinion; it sustains the interest of a relatively large audience. I believe there are several issues that should be addressed before the manuscript is ready for publication. I recommend publication pending a major revision. The Authors can find below more specific comments:

Comments:

-My main concern is that some of the discussions and key arguments are not backed up by appropriate analysis/references. For example, the analysis provided in Section 4.3 Dependence on Altitude and Distance does not support the conclusions. The authors

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already acknowledge that “there are just three grid cells available for this inspection which is clearly not significant”. This is true and, in my opinion, there are far too few data to gain traction on a possible link between dependence, altitude and distance. On the other hand, 11 out of 14 stations are in quite similar altitudes. I strongly urge the authors to eliminate Section 4.3, or at least, not to go beyond their own statement that “No clear functional dependence between the altitude of the stations and the Copula parameter α exists”.

-Section 4.4 Dependence of large-scale weather situation In this section the implications of the results are not discussed in enough details. For example, the manuscript reads: “The empirical CDFs of observed precipitation in Garmisch-Partenkirchen based on a given WT and certain groups of WTs are illustrated in Fig. 13.” Please note that the results should follow a discussion on implication of the results. Otherwise, readers have to interpret the results by themselves. The same comment applies to the following statement: “Both, the wet and the dry Copula density is similar to the unconditional Copula densities (compare with Fig. 8)”.

-The manuscript will be improved by just eliminating Sections 4.3 (Dependence on Altitude and Distance) and 4.4 (Dependence of large-scale weather situation).

-Page 3018, 1st paragraph: I believe that the correlation coefficient should not be the only measure to gauge performance, since the results may be misleading. The correlation coefficient should be followed by other quantitative measures such as RMSE or MAE.

-Page 3019: The manuscript reads: “The objective weather pattern classification method of the German Weather Service (Bissolli and Dittmann, 2001) shows only moderate potential to further constraint the model. Including information about the humidity of the troposphere can slightly increase the skill for bias correction compared to the Copula-based stochastic simulations without using large-scale information”.

This discussion overstates the implications of the results and does not acknowledge

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the limitations of the study (too few data to make such conclusion). I suggest omitting this statement or providing a more conservative one.

-Table 2 and the corresponding discussion: Given the tail of the data, Clayton copula is not the right type of copula family to be tested here. Instead, the Survival Clayton should be used which has a quite similar tail to that of Gumbel .

-Page 3015: "Figure 7 (bottom) illustrates the composite of the three piecewise CDFs for modelled and observed rainfall residuals." Again, the results should be followed by a comprehensive discussion. What does the figure mean? Why is it presented?

-This methodology can be applied on positive pairs (both RCM and observed precipitation > 0); please provide a brief discussion on the drawbacks and limitations of the approach. Note that a significant part of bias may be because of RCM false and missed precipitation.

-Page 3003: "For the mid-latitudes, large-scale stratiform events can be represented well by climate models resulting in a relatively good agreement between modelled (grid cell) and measured rainfall amounts (point scale)." Please provide a reference.

-The order of figures is chaotic; please note that figures should be placed in the order they are discussed in the main document.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 3001, 2011.

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