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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Indirect downscaling of global circulation model data based on atmospheric circulation and temperature for projections of future precipitation in hourly resolution" *by* F. Beck and A. Bárdossy

Anonymous Referee #2

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General comments:

The authors present an indirect statistical downscaling approach for hourly precipitation based on circulation patterns (CP) and temperature classes (TC). They assume that the distribution of precipitation is constant for each combination of CP-TC. They demonstrate the different behaviour of precipitation depending on CP, TC and season. Especially, they can show that heavy precipitation frequency within certain CPs depends strongly on temperature for the summer months. They apply the downscaling

approach for the 20th century run and the future A1B run of the GCM ECHAM5. The results indicate a decrease in summer precipitation but at the same time an increase in the number of heavy precipitation events. This is a novel method which has potential to be applied together with a rainfall generator for downscaling of high temporal resolution rainfall. Although the main assumption about the constancy of the precipitation distribution cannot be verified, the special consideration of temperature classes in addition to the CPs makes it physically plausible. The paper is well written and clear in structure. However, some issues mentioned below should be addressed in a revision before publication.

Detailed comments:

1. Title: The title is a bit long. I would suggest the following: "Indirect downscaling of hourly precipitation based on atmospheric circulation and temperature"

2. Introduction & Conclusion: I would not place here the main application focus on urban hydrology. The temporal resolution of hourly rainfall is too coarse for modelling of urban sewage systems; for that a resolution of 5 minutes would be required.

3. P. 8847: line 17: replace "temporal" by "spatial"

4. P. 8849 – 8850: Temperature subdivision: How is this relative subdivision in 5 temperature classes projected into the future for downscaling. Since the future temperature is increas-ing the same relative subdivision (5x20%) applied to a future data set would have differ-ent absolute temperature class limits. Does the assumption of the constant distribution of rainfall intensities still hold for different classes? This needs discussion.

5. P. 8852: More information about grouping of the CPs is required. How exactly is decided if the CP is cyclonic or anti-cyclonic. Generally, I would recommend including a table list-ing the 12 CPs, their main statistical characteristics and the associated group.

6. P. 8856, line 5"during the calibration period from 1991 to 2003" This is somehow confus-ing, since the figure refers to the two ECHAM runs with different periods. Please

try to make this clearer.

7. P. 8858: Is the discontinuity an indication of a non-stationary bias of the GCM with possible implications for bias correction? It would be good to discuss this briefly.

8. Outlook: This outlook is a bit outside the scope of this paper and it addresses again urban hydrology (see above). I would recommend to include information about future work in the conclusion section with a reference to “NiedSim” (but without more description).

9. Fig. 10: reference to C20 and A1B ECHAM runs is missing

10. Fig. 10, 11: I would recommend to us the same scale for the y-axis of the corresponding figures for the C20 and A1B runs; then the trend lines can be compared more easily

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 8841, 2013.