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Interactive Comment

Interactive comment on "Effect of spatial distribution of daily rainfall on interior catchment response of a distributed hydrological model" *by* J. M. Schuurmans and M. F. P. Bierkens

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- The paper is indeed missing information about the calibration and initial conditions and we have changed this (paragraph 2.2)
- It is true that most of the results are due to the same "input biases" of rainfall measured at 'De Bilt' (scenario 2). In Figure 3 we show that the cumulative rainfall in De Bilt is comparable to the range of values measured for the spatially variable rainfall scenarios. However, as the reviewer indeed mentions, the temporal distribution is in De Bilt very different from the other scenarios. This leads to differences in the development of discharge, groundwater and soil moisture in time. We mention that in the results sections where we choose to treat discharge, groundwater and soil moisture separately.

However, when we show the results of e.g. groundwater we refer back stating that we saw this phenomenon also for discharge.

- The conclusion 'the spatial distribution of rainfall must be taken into account more because it improves the basin-average incoming volume rather than because of some dynamic interactions with flow-generating processes' was drawn by Obled et al. 1994 as mentioned in the introduction. We found that for the general hydrological behaviour (e.g. average groundwater tables, water balance) of the catchment this conclusion holds because we did not found clear differences between the mean and standard deviation of the temporal groundwater level or temporal soil moisture for spatially distributed and spatially uniform rainfall scenarios. Also we did not find striking differences in the discharge statistics. However for the day-to-day variability this conclusion does not hold and therefore it is important to take into account the spatial distribution of rainfall. As an example we show the case of 1 May where clear differences in the spatial distribution of soil moisture and groundwater level can be found.
- We do not understand the reviewers comment about showing the reaction of simulated hydrological processes instead of state variables: we show the simulated runoff, which is a hydrological process. The soil moisture content is a state variable but a very important one that determines the amount of actual evapotranspiration and potential catchment storage. Showing the influence of rainfall on evapotranspiration is not very interesting in this case as it is a wet, groundwater controlled catchment, and evapotranspiration is hardly reduced.
- Fig 3: figure 3 is meant to show the range of values of the cumulative rainfall over the period studied (March-October). This is for the spatially uniform scenarios only a single value. The aim of this figure is to show how the cumulative rainfall of the different scenarios relate to each other. The spatial distribution of the cumulative rainfall of the spatially variable scenarios is shown is Figure 4 where one can get an idea of the median.
- It is not the aim of this paper to present the interpolation technique Kriging and we do not present the kriging equation. The idea of the two different forms of Kriging can be

found in the literature we refer to. However, an important parameter for Kriging is the variogram model that is used and this is given in the paper. This variogram model is used both for the ordinary kriging as well as for the colocated cokriging.

- Page 2187, line 4: The reviewer is right, 1-3- It is certainly true that in mountainous areas it is much more difficult to implement weather radars than in a relative flat country like the Netherlands. However, this does not take away the fact that it is very important to take into account the spatial variability of rainfall. Despite the difficulties of implementing radar and its shortcomings, it is one of the best options one has to capture the spatial variability of rainfall, also in mountainous areas. Papers of e.g. Daniel Sempere-Torres (Universitat Politècnica de Catalunya, Barcelona, Spain) show the implementation of radar images for hydrological applications, also in mountainous areas. Development in radar measured rainfall in mountainous areas in ongoing (e.g. Rain Measurement in Hilly Terrain with X-Band Weather Radar Systems: Accuracy of Path-Integrated Attenuation Estimates Derived from Mountain Returns, Delrieu et al., Journal of hydrology Vol 16 issue 4, 1999)

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