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Hydrology and Earth System Sciences Discussions

Interactive comment on "Uncertainties in climate change projections and regional downscaling: implications for water resources management" *by* W. Buytaert et al.

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I agree with the previous referees that the downscaling could have been done more carefully. It would be interesting to see the added value, if there would be one, of a statistical downscaling procedure. Or perhaps the authors could elaborate a little on this.

(See also reply to reviewer 2.) We agree that there is a lot of scope in improved statistical downscaling (which is indeed one of our conclusions) and we are happy to elaborate this topic more in a revised manuscript. However, it should be kept in mind that the primary aims of this paper are (1) evaluation of regional, dynamic downscaling;

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and (2) discussing the uncertainties in a water resources management context. As such, this paper provides a base line study as a reference for future improvements.

There are good references to earlier studies, but in the outlook I miss a reference to the ongoing CORDEX initiative, which would be very helpful for more in depth studies of regional climate modelling over South America. This seems to me to be more of a preliminary study to build furhter research on, and then a reference to ongoing research efforts woukld be welcome.

We will consider this.

I miss a description of the hydrological model. The references to Beven are to a text book with no page references. Either explain the model in equations or a descriptive figure or refer to a study where it has been applied. As it is now it is very difficult to follow the description of the model.

For reasons of conciseness we have left the equations out. The catchment moisture deficit store is described in detail in Croke's paper and we see little point in copying the equations from there. The linear store is one of the most common equations in hydrological modelling, but we will improve the reference (it's Beven, p. 106) and add some other useful and perhaps more accessible references.

In figure 1 it would be useful if you plotted the PRECIS grid points to get and idea of the spatial resolution before the rescaling.

We can surely do so, although it may even be more useful to plot the outline of the basin in Fig. 4.

Regarding evapotranspiration, you use Penman-Monteith for ET? Why was this choice made? Other studies, such as "Oudin et al, Which potential evapotranspiration input for a lumped rainfall-runoff model? Part 1 - Can rainfall-runoff models effectively handle detailed potential evapotranspiration inputs? Journal of Hydrology 303 (2005) 275–289" suggested that a simple ET model for lumped models was the best. Perhaps you

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can elaborate on this?

We did indeed use average evapotranspiration values rather than time series. Oudin et al. (2005) also used the Penman equation, which is very similar to the FAO Penman Monteith method, so our approach is actually very similar to their approach.. We would even argue in favour of the use of the Penman (or Penman Monteith) equation (when feasible) over more empirical methods in the study region, because of the extreme climate conditions (high radiation, low temperature). Empirical methods tend to be calibrated on very different climate conditions, which may make them more prone to errors when extrapolated compared to physically based methods.

But, as per reviewer 2's comment, we acknowledge that we need to elaborate more on the ET calculation procedure.

The Conclusions part is too long. I would suggest to move most of the text to the discussion part and keep the conclusions very short and to the point.

We don't think that the conclusions are particularly longer than the average HESS paper, but if the editor agrees, we do not mind moving some text to the discussion.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 1821, 2010.