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Hydrology and Earth System Sciences Discussions

Interactive comment on "Spectral representation of the annual cycle in the climate change signal" *by* T. Bosshard et al.

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1 Introduction

We would like to thank David Huard for his comments. Here we will address his comments specifically. We will also provide a final reply later.

2 Effect of natural variability on the ensembles mean

Figure 1 shows the difference of the precipitation change signal estimated by the harmonic smoothing model and the 31d MA. Although the data sample size is ten times larger than for single GCM-RCM chains, the fluctuations in the 31d MA are still substantial.
The main focus of the paper is the use of the climate change signal for impact studies. We strongly suggest not to use the ensemble mean to drive impact models. Impact models are usually highly non-linear. Thus, using the ensemble mean climate scenarios will lead to different results than using the individual climate scenarios and averaging over the impact model outputs. In the paper, we included the ensemble mean in Fig. 7-10 just for illustrative reasons.
We agree though that in climate studies, the ensemble mean is an important measure. In particular, most validation studies show that the ensembles mean generally performs best, even better than the best single participating model. Therefore, we plan to briefly discuss the effect of the spectral smoothing on the ensemble mean in the paper.

3 Work-around for the overshooting problem

All referees mentioned the overshooting problem to be a critical one. We therefore plan to introduce a new subsection after subsection 5.2 that discusses this problem in more detail. We will present a methodology how one could ameliorate overshooting problems. However, we will not include more model chains in the final analysis in order to be consistent with the ensemble of climate scenarios provided for impact studies in Switzerland.

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4 Relevance for bias correction

In the last paragraph of the section summary and conclusions, we mention that the problem of natural variability might be relevant for other bias-correction methods, too. We will also mention that spectral smoothing can be applied to bias-correction methods.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1161, 2011.

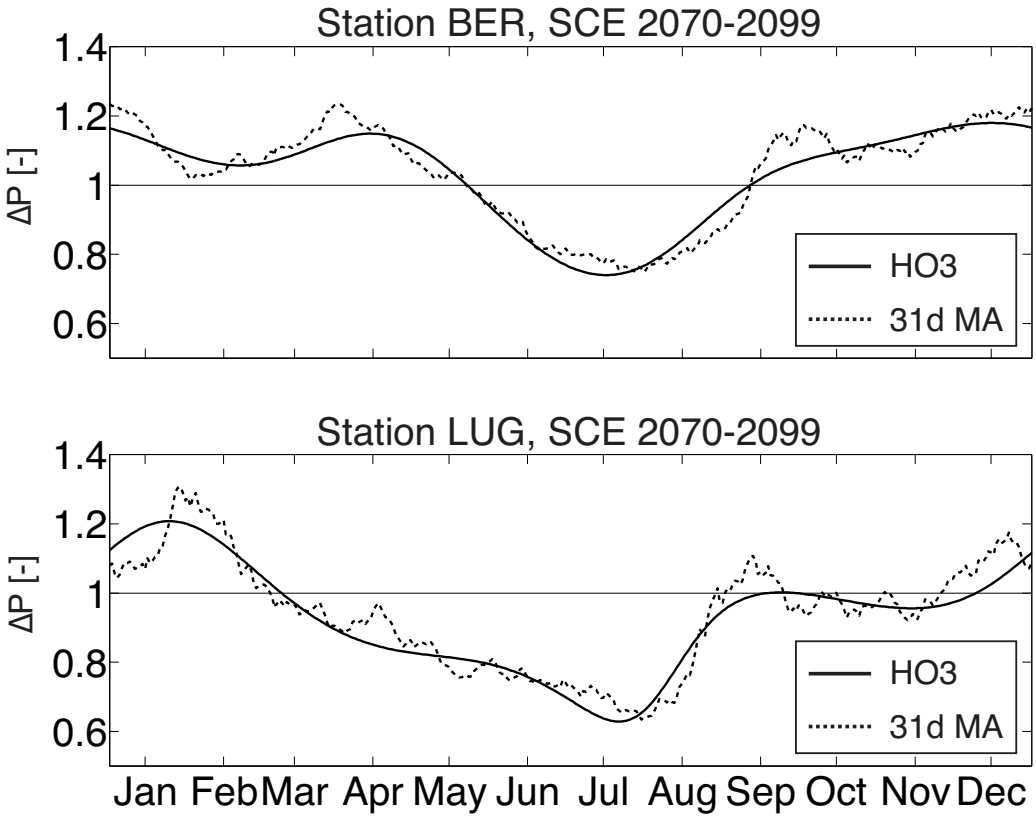

Fig. 1. Delta P of the ensembles mean at two exemplary stations estimated by the harmonic smoothing model (HO3) and the 31d MA.

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