**Hydrology and
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Interactive
Comment

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

**T. Bosshard et al.**

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## 1  Introduction

We would like to thank the reviewer for his positive and inspiring comments. In the following, we reply in detail to the referee's comments. We indicate what changes we intend to make to the manuscript in case the forthcoming reviews do not contradict.

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## 2   Detailed reply

### 2.1   Introduction

In the introduction, we will include the reference to the downscaling review of Maraun et al. (2010).

### 2.2   Techniques

The reviewer would like to have further information regarding the Box-Cox transformation. We will include a new text passage on p. 13, line 2: *"The Box-Cox transformation does not yield perfectly normally distributed residuals. Thus, we tested the robustness of the cross-validation result using non-transformed and root-transformed precipitation data as well. The results were very similar to the one in Fig. 4."* Below, Fig. 1 shows the results of the cross-validation for the Box-Cox, non-transformed and root-transformed precipitation data. Figure 2 displays the QQ-plots of the model residuals of an HO 3 model. Although the Box-Cox transformation produces residuals whose distribution follows a normal distribution more closely than the other transformations do, it is apparent that none of the transformations result in perfectly normally distributed residuals. However, since all the transformations yield the same result in terms of Fig. 1, it seems to be robust with respect to the distributional characteristics of the precipitation data.

We are thankful for the comment about general linearized models. We will include the mentioned references along with references to other methods that potentially are useful for modelling the climatological annual cycle.

## 2.3   Figures

In Fig. 5 of the paper, there really was a mistake in the colouring of the lines. Thank you for pointing this out. We will replace Fig. 5 in the paper by Fig. 3 below.

### References

Maraun, D., Wetterhall, F., Ireson, A. M., Chandler, R. E., Kendon, E. J., Widmann, M., Brienen, S., Rust, H. W., Sauter, T., Themessl, M., Venema, V. K. C., Chun, K. P., Goodess, C. M., Jones, R. G., Onof, C., Vrac, M., and Thiele-Eich, I.: Precipitation downscaling under climate change: recent developments to bridge the gap between dynamical models and the end user, Reviews of Geophysics, 48, RG3003, doi:10.1029/2009RG000314, 2010.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1161, 2011.
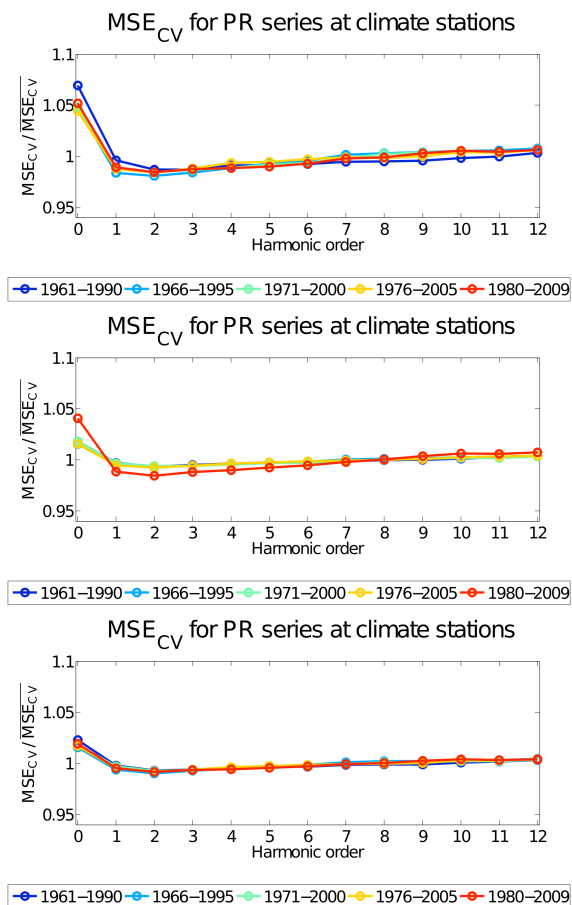
**Fig. 1.** Results of the cross-validation for Box-Cox transformed (top), non-transformed (middle) and root-transformed (bottom) precipitation data at Swiss climate stations.
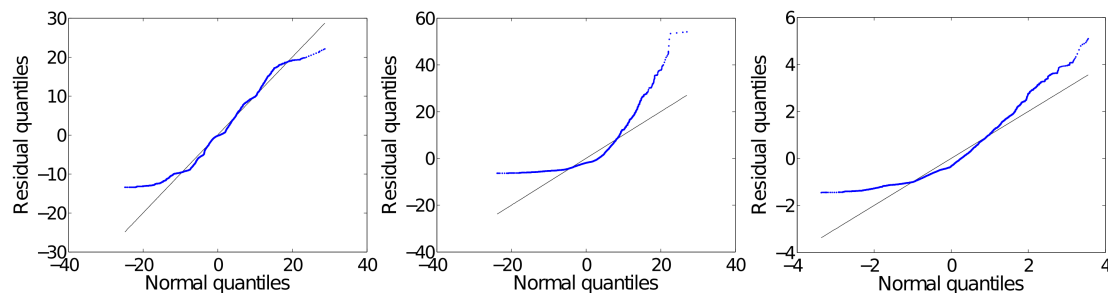
**Fig. 2.** QQ-plots of residuals of an HO3 model fitted to precipitation data at the station site Lugano using Box-Cox transformed (left), non-transformed (middle) and root-transformed (right) precipitation data
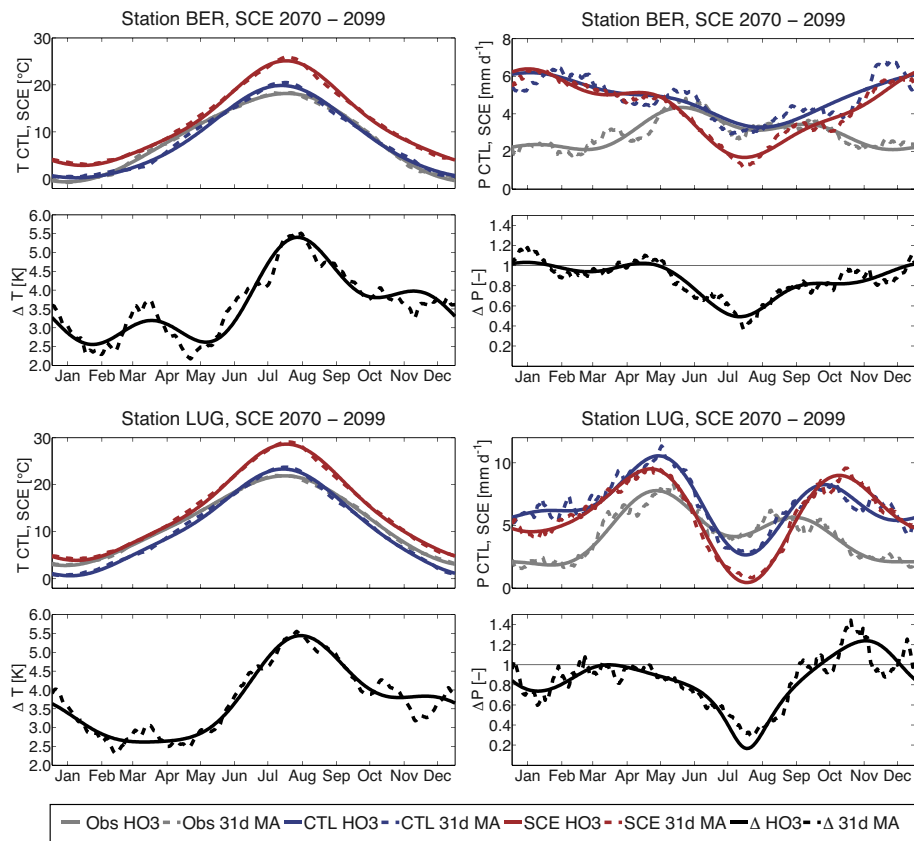
**Fig. 3.** Same caption as for Fig. 5 in the discussion article.