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Interactive comment on "Calibrating a process-based forest model with a rich observational dataset at 22 European forest sites" *by* David Cameron et al.

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We thank the reviewer for their efforts. This is our initial response to the more substantive points raised – a more detailed point-by-point response will follow later. The reviewer asked for more information about the model BASFOR, the data used, and the calibration methodology including details of the parameters.

As for model detail, we think we struck the correct balance with a concise description in the text, since the focus of the paper is not the model itself but the consequences of using rich datasets in calibration. The model is not new, it has been published (three papers are listed), and we provide full information online

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(https://github.com/MarcelVanOijen/BASFOR as quoted in the text) where the model itself as well as a 33-page user guide can be downloaded.

The input and calibration data that we used were not measured specifically for our study. They were measured at individual forest sites, mostly as part of larger thematic international projects such as CarboEurope and NitroEurope. Detailed descriptions of the measurements are thus available in other publications, and we provided full bibliographic information for each site in Table 2. It would lengthen our text unnecessarily to copy measurement information from these sources into our paper.

Details of the parameters calibrated in this study are given in tables in the supplementary material, as we mentioned in sections 2.4.2 and 2.4.3. However, as stated in the Introduction, our focus in this paper was on the impact of Bayesian calibration (BC) on model predictive capacity and "in particular, which observational datasets were most effective in reducing uncertainty in model predictions and data-model differences." We also explained in the Introduction why we did not clutter the paper with an analysis of parameter distributions: "Since model parameterisations are specific to models we will present results showing how model output uncertainty and model-data differences changed as a result of calibration rather than how the model parameter uncertainty changed as a result of the BC."

In contradiction to the reviewer's comments, we presented our results in considerable detail. Using ratios of RMSE and quantile ranges, we quantified the influence of the calibration on model-data differences and on uncertainty. We provide full quantitative information in the figures, while the text gives a more qualitative description in keeping with the focus of the paper.

We also stress that the final sections of the paper are no mere repetition of the Results, the opposite is the case. We used the standard approach of presenting results without interpretation in their own section, leaving the analysis to the Discussion and the Conclusions. In these latter sections, we analyse the key issue: How effective are

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the different observational datasets for reducing model-data differences and uncertainties? We conclude that: "Sparse plant and soil stock observations were more important for reducing model-data differences and uncertainty in above and belowground carbon pools than more plentiful carbon and water flux data" and we point out that there are exceptions for "ecosystem variables where only very few uncertain observations were available." Our second main question is addressed there too: "Are separate calibrations at forest sites more effective for improving model fit to data and reducing uncertainty than multi-site calibration?" Our conclusion on that question is that: "While separate calibrations at each forest site generally reduced model-data differences more than calibrating at all the sites together, parts of the ecosystem that were very sparsely observed benefited more from multi-site calibration." We believe these findings were properly discussed and are important.

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