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Interactive comment on "Long-range memory in millennium-long ESM and AOGCM experiments" *by* L: Østvand et al.

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1. We are well aware about the analytic results of Lennartz and Bunde 2009 on the bias of the ACF estimators, and we have discussed the same thing in a paper in JGR from 2013 based on a Monte Carlo study. In the revision we mention very briefly why we don't see the ACF as a good estimator an give reference to those two papers.

2. We believe the reviewer has a good point in also using the PSDs for beta-estimation, so we have done that in the revision. See our comment to dr. Henriksson.

3. We also agree that we should not use F for both DFA and WVA fluctuation function, so we have changed that. We cannot agree that the Haar wavelet serves our purpose better than the Mexican hat. The Mexican-hat wavelet is very standard in textbooks and

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programming packages, and can be intuitively interpreted as a local Fourier transform. A known weakness of the Haar wavelet is stronger spectral leakage (see e.g., textbook of Percival and Walden, 2008). Our main purpose to show the result for the Mexican-hat wavelet (and this was stated in the text) is to show how different methods can have different sensitivity to oscilliations. The Haar wavelet (there are different versions) will perform more similar to the DFA.

4. As will be apparent in the descriptions of the revisions given below, the results we obtained from HadCM3 were wrong. The true results are more similar to those obtained from the other models.

Main revisions:

We believe that reviewer #1 has a point in suggesting a more precise title of the paper. Thus, in the revision we have changed the title to:

"Long-range memory in internal and forced dynamics of millennium-long climate-model simulations."

The main other changes made in the revised manuscript are:

1.The data set used from the HadCM3 simulation was wrong (it only contained ocean data). We also wrote in one place that this simulation was a control run, which is not correct. We have presented analysis of the correct data, and since it is a forced run, we have also added a new figure with results from using the response model. Figure 1 representing the forcings has been modified and extended with the forcing of HadCM3. The results are much more in line with those for the other models studied, and enforces our conclusions.

2.We have addressed the comments by dr. Henriksson and the second reviewer by plotting the power spectra with monthly time resolution when available, and estimating the spectral index beta also from these spectra. Figures have been revised accordingly, and the captions have been extended and made more precise. Table 2 has also been

modified.

3.We have included a discussion of the results of Henriksson et al. on the COSMOS model.

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