



EGUsphere, referee comment RC2  
<https://doi.org/10.5194/egusphere-2022-1293-RC2>, 2023  
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## **Comment on egusphere-2022-1293**

Anonymous Referee #2

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Referee comment on "Improving Statistical Projections of Ocean Dynamic Sea-level Change Using Pattern Recognition Techniques" by Víctor Malagón-Santos et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-1293-RC2>, 2023

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In this study the authors used large ensemble simulations from one climate model to test to what extent pattern filtering approaches help to reduce internal variability in the dynamic sea level. They then discussed the benefits of using such approach to reduce uncertainties in pattern scaling of dynamic sea level change. This is an important research topic as large ensemble simulations are computationally expensive and usually we need to deal with limited or even single ensemble from climate model.

My main comment is that the reduced regression errors (residuals) in pattern scaling after applying the pattern filtering approach are well expected as the internal variability is reduced. I agree quantifying them is useful but the current manuscript fails to demonstrate more value for using such approach prior to pattern scaling, as claimed in the title and main message. Specifically, to what extent the application of pattern filtering could change the slope  $\alpha$  of pattern scaling? Is there a significant change? Could you please show this change not only for global maps but also for time series in key regions as examples? After all this is what we really obtain and need from pattern scaling.

Some minor comments below,

L21 "model disagreement" is not straightforward here – please consider rephrasing. In the context of last sentence does it refer to "climate model" or "statistical model"? should "disagreement" be "uncertainty" here?

L26 "MPI-GE" might not be familiar to some readers

L26 "so that internal variability is optimally characterized while avoiding model biases" –

please consider rephrasing. We can never avoid the model bias issue. My understanding is when using single model large ensemble simulations, the externally forced signal is optimally characterized, which provides important basis to test pattern filtering methods.

L27 "pattern filtering" do you mean the "two pattern recognition methods (L23)" or specifically the "signal-to-noise maximizing EOF pattern filtering (L24)"

L66 "natural" should be "internal climate" as used in most other places – please check throughout the manuscript for this.

Figure 3 It's unclear (1) how the number of ensembles needed is calculated; (2) what does "forced response variance" refer to. Could you please make connections to equations in section 3?