Interactive comment on "Partitioning climate projection uncertainty with multiple Large Ensembles and CMIP5/6" *by* Flavio Lehner et al.

Anonymous Referee #2

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This paper applies several large ensembles to evaluate to what extent the large ensembles can overcome limitations of an original approach by Hawkins and Sutton to quantify and illustrate uncertainty in future predictions and attribute it to different uncertainties. It is very well written and very interesting. I like that it also looks at temperature targets which is a nice extension of HS. i have two minor questions that the authors could consider strengthening - the conclusions mention the issue that the SMILEs might not quite span the model range and this kept worrying me through the paper - to what extent could differences between SMILEs and CMIP5/6 be due to a different set of models? ideally it would be nice to see a bit more discussion of this, or a sensitivity test to use a CMIP subset of runs that did SMILEs. (this might be near impossible with the original method of using only 1 run per model but that seems quite

a wasteful approach to me...). Also, do you think aerosol uncertainty is sampled well across SMILEs? Not doing so would have implications worth mentioning. - the point of changing variance of variability in the future (overcoming a particular limitation of HS) is a very interesting one and it doesnt get much space in the paper other than dashed lines in figure 7. could this be brought out a bit more - is the change in variance robust across models?

minor comments: the discussion of model imperfection l 44 or so could mention climate sensitivity uncertainty which also illustrates that even if technically reducable in practice this will be a slow processes. p 6 l 24: mention that I S M are variances Discussion l 17 p 21: This might also cross reference to signal to noise maximization used in optimal detection eg Hasselmann, 1979 or Allen and Tett.

Interactive comment on Earth Syst. Dynam. Discuss., https://doi.org/10.5194/esd-2019-93, 2020.