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Interactive comment on "Fast sensitivity analysis methods for computationally expensive models with multidimensional output" *by* Edmund Ryan et al.

Anonymous Referee #2

Received and published: 30 March 2018

The overall paper is interesting and clearly written. Its position within the literature is well justified. The comparison between the different GSA methods is well lead and the comparison setup is clear. The PCA which brings the most novelty and potentials should be developed.

Detailed comments:

- page 9: the authors should precise X are inputs and Y outputs in Eq (1) as well as their dimension in the context

- page 9: "the method operates by first generating N*2p matrix . . ." this first step of the method is not clear for unfamiliar readers

- page 13: the difference the GP and the GAM methods should be clarified

- page 14: the authors say that the p inputs x are independent variables, the independence is an assumption required to apply the proposed method. To extent this hypothesis is realistic? The authors could have precised this assumption earlier in the text to my opinion

- page 15: further details should be given on how the sensitivities with the hybrid methods. Moreover, one benefit of using PCA in more general setups is to work with independent variables (PCs). Could the authors justify the threshold of 99% in the PCs selection? This seems a high value compared to some common use of PCA

- How do the authors determine the number of needed runs from the emulators in this study?

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2017-271, 2017.