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Geoscientific Model Development Discussions

Interactive comment on "Application of all relevant feature selection for failure analysis of parameter-induced simulation crashes in climate models" *by* W. Paja et al.

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Firstly, we would like to thank the reviewer for the general opinion that the subject and results of the study may be useful for the climate modelling community.

As computer scientists developing and applying machine learning methods we are very much interested in making fellow scientist in different disciplines of science aware of applicability of our tools and methods for their research problems. We have strived to make our article both reasonably succinct and accessible for non-specialists. Apparently, we have not achieved the second goal – the referee recommends serious rewrite of the article.

Assuming that we will be given opportunity to improve the paper we would be grateful for some more detailed hints regarding the accessibility for the climate modellers. In particular which sections should be extended and what issues require deeper explanations.

Regarding the observation of the referee, that the main result is not much different from the results published by Lucas et al. and hence the value of the contribution is marginal. We believe that there are at least three reasons why the work is valuable for the climate modellers.

Firstly the confirmation of the main results of the previous work by a different methodology is valuable by itself. We have shown, that application of more rigorous and computationally demanding methods confirmed the importance of 6 out of 8 parameters, and we concluded that 3 out of them were non-redundant. We don't say that the 4th of the most important parameters from Lucas et al. is not important, but that nearly all variance in data could be explained by models built on 3 main parameters. This result can be directly useful for modellers since it reduces the effort required to improve the simulation codes. While we don't have experience with climate models, but general experience with software is that difficulty improving the code grows combinatorially with the number of free parameters, hence the reduction from four to three may in some cases turn problem from very hard to a reasonably hard and help to get solution quicker and with less effort.

Secondly, we have shown that some conclusions of the original work were far-fetched and not supported by data. In particular Lucas et al. analysed minute effects of different thresholds on the AUC obtained on the single split of data between training and test set. We have shown, that this effect is dwarfed by variance due to the composition of the training and test sets, and hence is irrelevant. This part of the paper shows that any conclusion drawn from application of machine learning methods must be supported by a solid cross-validation study.

Finally, we have shown a very simple methodology for establishing the importance of variables for complex and obscure phenomena. Here it was applied to analysing the influence of the selected parameters for the simulation crashes, however, it can be equally well used for analysis of the standard simulations and exploring unexpected relations between variables.

Interactive comment on Geosci. Model Dev. Discuss., 8, 5419, 2015.