Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2020-393-SC1, 2021

Geoscientific Model Development Discussions

Interactive comment on "Physically Regularized Machine Learning Emulators of Aerosol Activation" *by* Sam J. Silva et al.

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Received and published: 7 January 2021

We would like to bring into attention the work we have done related to the manuscript topic and which should at least to be cited. In Lipponen et al. (2013), a very similar approach to the presented one was introduced. Lipponen et al. (2013) used an improved hybrid physical-machine learning model to improve the representation of cloud droplet formation in large scale models. A machine learning regression-based emulator model was employed to reduce the approximation error caused both by the employment of ARG-parameterization for cloud droplet activation and low number of aerosol size sections in the SALSA aerosol module. In this manuscript under evaluation, the authors refer to this approach as a physically regularized machine learning emulator. Later, in Lipponen et al. (2018), it was also demonstrated that the approximation error–

corrected simulation improved signiïňĄcantly the accuracy of the reduced model and also outperformed the approach where a statistical learning-based predictor is constructed directly for the accurate model without physical constrains or information from the reduced model.

Lipponen A., V. Kolehmainen, S. Romakkaniemi and H. Kokkola: Correction of approximation errors with random forest applied to modeling of aerosol first indirect effect, Geosci. Model Dev., 6, 2087-2098, doi:10.5194/gmd-6-2087-2013, 2013.

Lipponen, A., J. M. J. Huttunen, S. Romakkaniemi, H. Kokkola, and V. Kolehmainen: Correction of Model Reduction Errors in Simulations, SIAM Journal on Scientific Computing, 40:1, B305-B327, 2018.

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