



EGUsphere, referee comment RC2
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Comment on egusphere-2022-773

Paula Harder (Referee)

Referee comment on "Enhanced natural releases of mercury in response to the reduction in anthropogenic emissions during the COVID-19 lockdown by explainable machine learning" by Xiaofei Qin et al., EGU sphere,
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This work investigates how anthropogenic and natural mercury emissions differ before, during, and after the COVID-19 lockdown. The paper aims to show that the decrease in anthropogenic mercury emissions during the lockdown led to an increase in natural release. The methods used to quantify that are correlation analysis, a PMF model and a neural network (NN) combined with SHAP values. The NN learned to predict gaseous elemental mercury (GEM) given other air pollutants and atmospheric conditions and then applies the SHAP approach to obtain how much each input feature contributed to the prediction. The choice of method, using an NN with SHAP values, seems suitable for this setting. The performance of the NN is not very good, this will also affect the interpretability of the SHAP values. In general, more details of the NN would be helpful.

From my point of view, this paper needs rewriting and changes before it can be accepted for publication at ACP.

Further comments:

Line 106: The PMF approach should be mentioned in the introduction

Line 155: Please include a few details of the NN in this work, such as data size, how the train-val-test split was done, and a comment on hyperparameter tuning

Line 284: R^2 values are missing in three out of the nine subplots

Line 284: What are the lines shown in the plots and why aren't they shown in each of the subplots

Line 293: The R^2 score of 0.67 is okay, but not great.

Line 293: It would be relevant to know the different performances of the NN evaluated on the pre-lockdown, lockdown, and post-lockdown periods.