Dear Editor,

We would like to make an additional response to specific comment #12 of referee #3 on our manuscript entitled "Contributions of meteorology and anthropogenic emissions to the trends in winter $PM_{2.5}$ in eastern China 2013–2018" (MS No.: acp-2022-304). Reviewer's points in black, our responses in blue.

Anonymous Referee #3

(12) Lines 166-169, I suggest the authors to provide some theoretical foundations to support this interpretation.

Response:

In the following we present a simplistic idea about a possible theoretical foundation to support our alternative interpretation of "the maximum possible contribution of the independent variable to the dependent variable". As an example, Figure R1 below depicts an MLR analysis of the contribution of emission to the linear trend of $PM_{2.5}$ in BTH. It can be seen in Figure R1 that the MLR analysis is, in effect, performing the best-fit between the red line (emission) and the black line (observed $PM_{2.5}$). In other words, the best-fit enables the red line to attain the "maximum possible contribution" to the variability (including the linear trend) of the black line, where the "maximum" is established because all factors-other-than-emission that may contribute to the variability are excluded in the best-fit process. We propose the argument above as a possible theoretical foundation to support our alternative interpretation.

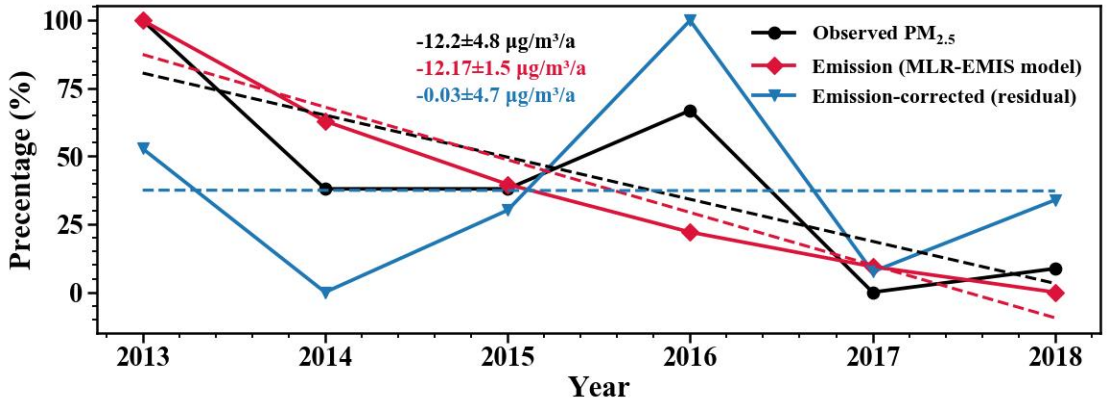

Figure R1. Results of MLR-EMIS analysis for 2013–2018 in BTH. Temporal variations of observed winter $PM_{2.5}$ concentration are shown in black, contributions of anthropogenic emissions to the $PM_{2.5}$ trend are shown in red, and the residual is shown in blue. Values inset in each panel are the ordinary linear regression trends, with 95% confidence intervals obtained by the student's t test.