

## Review for Manuscript-Revised Version/Review 2

Title: Technical note: A framework for causal inference applied to solar radiation and temperature effects on dissolved gaseous mercury

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We thank the authors for their keen efforts to revise and enhance this highly interesting paper with valuable contributions. This should also kindle more interests in application of causal modeling and inference in scientific experimental research in general, and in mercury research in particular.

The revised manuscript now sees significant refinement, clarifications, and enhancement, particularly regarding the assistance to embrace more extended range of readers who are not well versed in this investigation approach and tool.

For the present reviewer, two issues are of concern and now become clear: (1) the causal inference does not determine if two factors are causal related, (2) the causal inference is run by using modeling approach, i.e., using model-generated data, rather than real measured DGM data.

The causal inference functions by assuming causal relationship between factors and then inferring the size and nature of a particular effect (direct, indirect). These inference outcomes may not be directly available from experimental investigations. Hence, causal inference is a powerful tool to fill the gaps that experimental science may not readily handle or overlook. A joint effort from both experimental investigation and causal inference would greatly enhance the research, especially in the areas such as environmental sciences that involve systems and processes extremely complicated, physically, spatially, and temporally.

I'd just like to have one more suggestion to further enhance this paper:

It'd be helpful and insightful to compare the causal inference modeling approach and scientific modeling approach.

A summary of the causal inference modeling approach has been attempted as above. The scientific modeling approach may be summarized as follows:

First a model (physical, statistical, or empirical, or hybrid, etc.) is constructed, and then it is calibrated with real data to handle the model parameters, and then it is tested and verified with real data. So the core of this approach is the governing of the model by real data experimentally obtained or field-measured. This differs largely from the causal inference modeling approach as the comparison shows. This difference may attribute to the confusions associated with the causal inference modeling approach.

So, an addition, somewhere in the paper, of a concise description of the difference between the causal inference modeling approach and the scientific modeling approach would be beneficial and valuable. With the above description added, this paper would enjoy an even stronger standing.

I really appreciate this review opportunity through which I learned a lot, lots of new things and perspectives and insights. Many thanks. This revised paper may be accepted for publication with a minor addition and enhancement.