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Geoscientific Model Development Discussions

Interactive comment on "Spatio-temporal variability in N_2O emissions from a tea-planted soil in subtropical central China" *by* X. L. Liu et al.

Anonymous Referee #2

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General comments

This manuscript tried to reveal spatio-temporal N_2O emission from tea field in central China. I agree the topic is important and the intensive field measurements are worth to publish. But, also, I think the topics and methods (empirical approaches) are not entirely enveloped in GMD scopes. In addition, there are not enough information for material and methods. And I found some fatal flaws and misunderstandings in your statistical analysis manner. So, I cannot recommend to publish in GMD.

This manuscript concluded the range of spatial dependency of N_2O emission was 0.41 m (by the sum-metric model according to Abstract and Discussion), however, the intervals of spatial sampling was 1.0 m. This results suggested just "don't apply inter-

polation by kriging to N_2O emission in this field" in your best model. And, I have a particular concern about how to fit and choice the semivariogram models (i.e., spherical, gaussian, exponential, linear...). We need a objective criteria for the selection of the semivariogram models. There are no detail descriptions in this manuscript. For example, in figure 5 (a), it seems to use zero-nugget parameter model (we are not sure about how to do here.). But, the fitted line obviously failed to trace the variogram both in the original and residual. Even in the residual of linear model, the assumption of zero-nugget model is too strong for any models especially in this insufficient resolution in sampling scheme (especially for spatial). I think any models (separable, metric, product-sum , sub-metric) didn't work here.

From the other aspect, the linear model (i.e., $\mathrm{M}(s,t)$) have a bigger issue to apply this framework. The covariate Position had a storing spatial information and structure, even though this is (may be) categorical variable. Since it seems not to apply simultaneous inference for $\mathrm{M}(s,t)$ and $\mathrm{V}(s,t)$, so $\mathrm{M}(s,t)$ unintentionally includes much spatial structure. In addition, there no information for explanatory variables (what is full model? What is "Position") for the linear model in material methods.

You have to consider autocorrelations in the regression model (eq. 22). In this paper, authors revealed spatial and temporal dependencies in N_2O emissions by geostatistics. So, the degree of freedoms in your regression models are overestimated, compared to actual values. The sample (N = 2880) is not independent.

For the model comparison, you should use 'information criteria' instead of goodness of fits (i.e., RMSE, ME, R-square). Simply, the goodness of fits increase with increase of number of parameters.

P17L9 and Figure 4 cannot support the decision for the transformation of data. The residual of linear models is key information for whether to transform data or not.

Individual comments

P2 L13 Log-transformation cannot deal negative values. There are no information for the treatment of Negative values in this procedure.

P2 L14 "Position" is not defined in this abstract and material & methods.

P9 L5-10 2 times gas sampling is not recommended for flux estimation in closed chamber methods from the view to "chamber effect". This resulted in the underestimation of N_2O emissions.

Table 1 RMSE and ME are not "dimensionless"

Table 1 ME in Metric may be a wrong value.

Fig 3 Not appropriate visualization for spatial temporal data.

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