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Interactive comment on "Uncertainties in the national inventory of methane emissions from rice cultivation: field measurements and modeling approaches" *by* Wen Zhang et al.

Anonymous Referee #2

Received and published: 15 November 2016

I agree with referee #1 that the paper 'Uncertainties in the national inventory of methane emissions from rice cultivation: field measurements and modeling approaches' by Zhang et al. is an important and nice study regarding general uncertainties evolving during regional/national GHG emission inventories. I also agree with referee #1 that national estimates of CH4 emissions should be more emphasized. My main criticism relates to the presentation of the study. Material and Methods, Results and Discussion sections all need revisions in order to improve the reader's access to the main points of this study (see specific comments).

Specific comments:

P1 L25: Mention that regression models are taken from literature.

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P1 L27-28: Use clear measures and give respective values instead of using the vague term 'model performance' only.

P1 L30: Absolute values of simulated methane fluxes are meaningless here since context (e.g., different irrigation, straw management, ...) is not clear yet.

P4 L19-21: Statement is not very intuitive. Why should 'non-key' factors lead to significant errors? Factors leading to significant errors are implicitly named key.

P5 L21-22: Imprecise formulation, inaccuracies of models are manifold and should be defined more clearly based on common nomenclatures in literature, see for example nomenclature and definitions by (Kennedy and O'Hagan, 2001). Nomenclatures and definitions should be revised and standardized in many parts of the paper.

Kennedy, M.C., O'Hagan, A., 2001. Bayesian calibration of computer models. J. R. Stat. Soc. Ser. B Stat. Methodol. 63, 425–464. doi:10.1111/1467-9868.00294

P5: L34-36: Why were these two regression models chosen? It would be very interesting to see how IPCC emission factors, which also account for, e.g., different amounts of straw and different irrigation schemes would behave.

P6-7 Formulas 1-4: Unclear why these measures have been used. Give proper descriptions, meanings and references to 'bias' and 'total error' and compare both to each other.

P7 L12: ' errors in the performance of the method': unclear formulation, use consistent nomenclature for different error/uncertainty sources

P7 L 15: Give more information regarding your Monte Carlo simulation and PDFs since this is an important determinant of posterior uncertainty.

P8 L1 On what is this assumption (amount of stubble) based?

P8 L1-11: What is the difference between stubble and incorporated straw?

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P8 L15-16: Be more precise here and mention considered irrigation schemes and how the model handles them.

P8 L28: Probably Appendix B is meant.

P8 L33: In section 2.4, the description of used formulas should be improved since the combination of model and model input uncertainty is a central point of this study. The derivations of formulas in the Appendix are unclear. Give consistent names and meanings to each symbol that is used. Parts in the Discussion sections refer to the meaning of formulas and measures and should be moved here.

P9 L27: Do you mean 'harvested-area-weighted' or 'cultivated-area-weighted'? Since cropping intensity (number of crops per year) varies, the weighted mean should be derived based on harvested area. In addition to area weighted means you should also consider seasonal means. A given amount of data may refer to different seasons, e.g., winter, spring, summer and autumn with strongly varying potentials of CH4 emissions. Most likely the seasonality distribution of observations does not correspond to the actual seasonality distribution of rice cultivation in China.

P10 L18-21: Be more precise how measurements are dependent from each other. The potential dependency of measurements is not discussed in the Discussion section.

P10 L12-16: Standard Error (SE) and deviation are very common measures and do not need explanations/references. To my understanding, the presented SE refers to the variability of different observed mean fluxes from different field sites. How are measurement errors reflected? What do you mean with representative error?

P10 L25: Present average values of overestimations for both models.

P10 L35: Why is 'total error' and not 'bias' interpreted as model performance? In order to underline this statement, more measures should be used, e.g., root mean squared error, R2, model efficiency.

P11 L22: I miss the discussion of these values. Are such uncertainties small or large

compared to other studies?

P11 L23-25: Discussion is missing.

P11 L30 - P12 L14: This is rather introduction and representing of results than discussion.

P12 L10: Temporal variations are not presented.

P12 L15-17: Unclear argumentation.

P12 L18-22: Unclear argumentation. Model performance was assessed with site-specific input and not with regional averages. The representation of experimental measurements for larger regions and associated uncertainties should be independent of models. Discussion of comparison between model and measurements at site scale could be moved to a separate subsection.

P12 L31-33: Should be moved to the Results section. Use consistent nomenclature, i.e., the term 'model fallacy' has not been used beforehand. Do not repeat formulas from the Material and Methods section in the Discussion.

P12 L35 - P13 L14: Much of this information belongs to the Material and Method Section and to the Discussion. Key results (e.g., '56.6% of total uncertainty originates from the model'), which are also presented in the abstract should be first presented in the Results section and subsequently discussed. Appropriate discussion regarding the different uncertainty sources (model versus input) is missing. Argumentation regarding 'imprecision random noise and/or unknown factors' is unclear.

P13 L27 - P14 L16: Remove this section from the Discussion. This is partly Material and Methods and seems to be an arbitrary example of model parameter uncertainty that has been neglected and thus is not much contributing to this study.

Fig. 5: Use identical axes for all plots.

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