

Interactive comment on “Estimation of nighttime ecosystem respiration over a paddy field in China” by M. S. Hossen et al.

Anonymous Referee #2

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The authors investigate the necessity of using a canopy storage term to correct nighttime eddy covariance data on calm nights. There are some issues with description of the site and the development of an ecosystem respiration model. They say that irrigation and drainage affect paddy ecosystem respiration, but there is no measurement or mention of these practices in the study period. There is no test of the ecosystem respiration model against independently measured data, and therefore no validation that the model is correct and responsive to changes in the environment. They use an inappropriate environmental variable (air temperature) to drive the respiration model and suggest that field water status is another important variable, but do not include it in their model. The discussion needs to emphasize the authors work and the consequences of the results. 1. Measurements were only made during a single rice growing season (120 days). This may be a good test of the technique, but needs to be stated

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in the methodology. Also the relationships may change with the other two landuses that occur during the rest of the year. 2. More information is needed in the methods to characterise the vegetation. What proportion of the “paddy fields” were planted that year? Is it a homogeneous site, or a patchwork of different management treatments? What proportion were flooded and for how long? 3. The site was 2 km from a residential site. Could there have been any industrial or domestic influence on the CO₂ concentrations at the site, especially under calm conditions? 4. Many sensors are mentioned and not all are used in the final manuscript, remove those not used. 5. Soil heat flux plates were installed in an adjacent grassland. Why not the paddy fields? Was there any attempt to determine energy budget closure? 6. Page 1208 line 9. Was the site really homogeneous for all directions? 7. The CO₂ profiles were calculated as though the sensors were representative of the volume below their height. Maybe a better option would be to recalculate the storage using the inlets as representing the volume between the sensor and 50% of the height to the next sensor. 8. Section 2.5 is a bit thin. Please give some idea of the amount of data that was usable and acceptable for further calculations. 9. The construction of an ecosystem respiration model is fraught with problems. Why is surface albedo used to separate growing periods. How was this measured and over what area? Is there any validation between albedo and ecosystem respiration rates. The relationship between albedo and plant biomass is not a linear function and it saturates at high biomass. Does the presence of absence of water make a difference to the measurement of albedo or the respiration rates? 10. Why did they use air temperature instead of soil temperature (especially as soil temperature was measured)? 11. Some of the time periods using respiration model indicate a decrease in respiration with an increase in “air” temperature. Is this correct? How much confidence do the authors have in a model with an r^2 of less than 0.3? 12. Figure 2 has “general” and alternate” methods – these are not described. 13. The terms albedo, biomass index, biomass/leaf area index, and canopy cover are all used as variables, but are ill defined and data are not presented. 14. Page 1210 line 24. “The NEE threshold was defined...” This needs to be better defined as it is

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of utmost importance in the context of the analysis. 15. The volumetric soil moisture content in the grassland remained above 0.40 m³/m³ for the whole study, therefore no soil moisture deficit factor was needed or included in the ecosystem respiration model. However, if the paddy fields were flooded or drained may have had a large affect on the respiration rates. 16. Section 3.1 At the beginning of the growing season H was not around 100 W/m², and was not similar to LE. 17. P 1213 line 1. How do the authors know that the respired CO₂ remains trapped below 3.5m? It could be moving off site as near-laminar flow. 18. Page 1214 line 5. Air/soil temperature is not dependent on soil respiration. It is the other way around. 19. The conclusions seem contradictory. In conclusion 1 they state that underestimation of respiration is low under calm conditions, and in conclusion 2 they say that the addition of the storage term can greatly reduce the nighttime flux underestimation under stable conditions. If the underestimation is low then is the storage term needed at all? Is there a difference between calm and stable conditions, if so then please clarify.

Table 1 There are no units given for Re (also in the text) Fig 2. Radar is mentioned but not described. Fig 4. Daytime Ec – is this the maximum or average flux?

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