Atmos. Chem. Phys. Discuss., 10, C7397–C7399, 2010
www.atmos-chem-phys-discuss.net/10/C7397/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Components of near-surface energy balance derived from satellite soundings – Part 1: Net available energy" *by* A. Jarvis et al.

A. Jarvis et al.

k.mallick@lancaster.ac.uk

Received and published: 11 September 2010

Referee #2 (R2)

General Comments I think the paper is generally well written and structured and suggest in my view a novel methodology using routinely available remote sensing information (AIRS and MODIS) to extract global scale net radiation (or better net available energy) data. These estimates are compared to 30 FLUXNET sites with showing reasonably good results. Given the 9 issues raised by anonymous reviewer #1, I would like to draw some attention to the following points.

1. I am not so much concerned about the "simplicity" of the used equations to de-

rive Rn, on a monthly time scale they might be sufficient. However, I think a type of quantification of the impact of uncertainties in e.g tau and other parameters used in the approach would be a way of responding to this issue.

Response: Following R2's suggestion we have now conducted a sensitivity and uncertainty analysis to expose the 'measurability' of NAE (and other core variables). The analysis is restricted by the assumptions we have had to make about the likelihoods of the inputs ($\pm$10% uniform distributions for all non-temperature terms and $\pm$1K uniform distributions for all temperature terms as indicated in the AIRS database.) but means we can report both an estimate of the uncertainty on the core outputs (NAE, G, RN, λE) in addition to the partial sensitivities of these variables to the inputs used to calculate them. The revised paper will report these results and discuss the implications of these findings for the interpretation of the results. In summary, although the NAE (and allied variables) are uncertain when derived in this way, they remain significant and the results broadly unaffected.

2. An error analysis in general, considering the non-closure of the energy – balance at micromet. measurement sites and all individual components used in the approach would address also parts of issue 5-8 of #1.

Response: see above

3. I also clearly see the scale issue when comparing RS derived information on Rn with FLUXNET scale measurements. What are the spatial variations of Rn to be expected within a 1 x 1 pixel? I would like to see some information/answers to that question.

Response: This is discussed on page 14400, L3-17. In addition, the spatial standard deviation in Rn can vary from 15 to 60 W m-2 which is principally due to difference in regional average surface albedo yielding difference in regional average Rn (Oliphant et al., 2003). This detail will be added to the paper.

4. How do others groups/institutions (e.g. ECMWF) calculate those fluxes? ECMWF

provides global for- and hindcasts for Rn? How do the here calculated monthly fluxes compare to those? How could authors argue that they “improve” results compared to e.g. ECMWF products?

Response: A meaningful intercomparison is not a small task and is part of a model intercomparison project planned to start in October this year. As a result we ask that the tower evaluation be taken as sufficient for this publication. However, we will add a brief discussion of the methodological differences of our stated approach with those of e.g. ECMWF. The justification for not exploiting either the ECMWF products or methodology is not because our approach is superior (it may well not be) but we have tried to restrict the approach to using only the AIRS data to ensure the estimates do not suffer unduly from blending different data sources. Again, we will stress this in the revised paper.

In summary, I see - after thoroughly considering some of the issues above - this paper might be able to add some contribution to the atmospheric science community.

REFERENCES

Oliphant, A. J., Spronken-Smith, R. A., Sturman, A. P., and Owens, I .F.: Spatial Variability of Surface Radiation Fluxes in Mountainous Terrain, J. Appl. Meteorol., 42, 113 – 128, 2003.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 14387, 2010.