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Hydrology and Earth System Sciences Discussions

Interactive comment on "Measurement and estimation of the aerodynamic resistance" *by* S. Liu et al.

Anonymous Referee #3

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General Comments

The aerodynamic resistance, rah, is a key parameter in the evaluation of heat (and water vapor) fluxes for related algorithms of remote sensing. The paper gives a good introduction to the up to date studies on this topic. It is informative to provide observations of rah by a very simple instrument, the evaporation-pan, and compare the results with that of eddy-covariance system. Both have similar diurnal variation and the relation with wind speed. The paper reviewed most popular methods in the literature in the calculation or parameterization of aerodynamic resistance, directly compare the results from those models with careful arranged field observations. It confirms our basic understanding for selecting proper method in the calculation of rah in remote sensing models. I agree with the interactive comments by anonymous referee #1 (published on

17 may 2006), the analysis in Section 4 is comparatively superficial. With wealthy field observation data and proper understanding of state-of-the-science of evaluating rah in remote sensing model, the authors would give more directive conclusions.

Comments for revision

1. All the 7 models (section 2.2.1 to 2.2.7), 3 or 4 of them are based on Monin-Obukhov similarity theory of atmospheric surface layer, where Eq. (7) (Thom model) is from the typical integration form of flux-gradient relationship of similarity theory, the fundamental formula for most applications up to date. Because fluxes (momentum flux u* and sensible heat flux H) are implicitly in the stability parameter L, when we have good observation of fluxes, also, good estimation of roughness z0m and z0h, aerodynamic resistance rah should be most precisely calculated by this equation. Other models should be compared with this 'standard'. Some models or equations introduce other parameters (such as rb in Eq. 3, Km and Kh in Eq. 14, etc.), which cause other uncertainty, and actually do not supply more information.

2. Some models developed in earlier periods have rather rough simplifications, or, parameters within it are actually difficult to evaluate generally. It is not worth to repeat and used for comparison again. Especially, eddy-covariance method develops so rapidly in last two decades. Some old model is hardly to use again in practical applications nowadays.

3. Some models were possibly developed in a specific situation (area, climate). In that situation, the model(s) would also be rather precise. Sometimes we could not simply say a model is worse than others. A careful analysis (to find reasons) is always necessary.

4. Section 3 (Page 692), the description of observation site is a little prolixity. To say the 'experimental field was Ĕ167 hectares' is confusing. Actual observation field is probably as later mentioned 1000m by 500m. The field observations were well organized. It is necessary to describe mainly (in rather detail) the configuration of instruments,

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possible effects of the environment (fetch, power supply, weather etc.) that induce uncertainties. Readers of this magazine may concern your data quality, and based on this, to judge your conclusion.

5. The relationship of rah with wind speed is reasonable. Why rah varies as 'U' type in daytime hours? Is it also an effect of wind speed? Particularly, the result of inverse 'V' type of rah at night time hours is more difficult to understand. At night, heat fluxes become much smaller than daytime; Observation error is comparatively much larger. How much is this influence?

6. The evaporation-pan is possibly a useful simple instrument. However, its field use may need much more manual attention by experienced operator, including the use of dry-wet bulb psychrometer in measuring air humidity and to keep a proper wetting of the 'moist surface'.

7. As Referee #1 mentioned, it is crucial to determine roughness z0m and z0h properly from your experiments, which affect the final rah calculation greatly. The authors may have already done some works on the evaluation of z0m and z0h. It is necessary to give some descriptions on these parameters, even you may have another separate paper later.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 681, 2006.