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

S. Liu et al.

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The authors thank Referee #1 for the detailed review and comments on this paper. Following is our response.

Major comments:

(1) With respect to that some data for nighttime were removed in Figure 1, which Referee #1 mentioned, the reason is that there were electric power failures on 6th, 19th, and 27th of June, which caused malfunctions for the eddy correlation system at nighttime and lasted for several hours. There have been no data missing for other days. As for the aerodynamic resistance measured by evaporation pan, because evaporation is very small at night and measurement error is large, we just used the daytime data from 7:00 to 17:00.
(2) We agree with Referee #1 that evaporation from a smaller pan is usually larger than from a larger pan, so the resistance measured by a 15 cm diameter pan is smaller than that by an eddy covariance system. This explains the phenomenon in Fig. 3. We will add the explanation to the revised paper.

(3) Referee #1 thought that the aerodynamic models could be grouped in two types. We agree with it. There are a lot of Aerodynamic resistance models (Itier, 1980; Hall, 2002; et al) and different classification standards from different perspectives. Our purpose is to compare several popular models with field data so as to choose better ones in the calculation of aerodynamic resistance in remote sensing models.

(4) Referee #1 commented that the authors did not show any comparisons of heat fluxes. In previous papers, some researchers have had this kind of indirect comparisons (e.g. Xiexianqun (1991), Kalma(1990), Ham and Heilman (1991)). Now we have aerodynamic resistance data measured by two different methods and to compare them directly may avoid the effects of other parameters. This would be better than the indirect comparisons.

Specific comments:

(1) Referee #1 pointed out that it was better to use symbol “rah” instead of “ra” for heat transfer resistance because aerodynamic resistance could be either for momentum transfer or heat transfer. We agree with it and will use “rah” instead of “ra” in the revised paper.

(2) Referee #1 had a comment on the relationship between aerodynamic resistance and wind speed. Here, we just show the relationship between those two rather than to help in making a parameterization scheme.

(3) L in equations (7-12) is measured by the eddy correlation system.

(4) Referee #1 mentioned that the solution for stable case in the original Choudhury-1 model (Eqs. (27-31)) was not correct. We agree with it (Byun, 1990; Lee, 1997; Yang
et al., 2001). There is an error in Equation A (3) in Choudhury (1986). It needs a minus sign at left hand side. So we will use the model of Yang et al (2001) to replace Choudhury-1 model in the revised paper.

(5) For the 5th and 6th points in specific comments, one of the co-authors (L. Lu) has been calculating kB-1 and z0m with field data. And we will determine the values of kB-1 and z0m based on experimental data and put them into models in the revised paper.

(6) The surface emissivity is determined by an instrument for measuring directional emissivity, which consists of three parts: objects, the cavity and an infrared thermometer (IRT) (Xu et al (2004) and Huang et al (2005)). The instrument has been patented in China and is convenient and effective for measuring thermal infrared multi-reflection using the cold sky as radiation source.

(7) We thank Referee #1 for his suggestion in sensitivity study and we will take it into account in the revised paper.

Minor comments:

In this paper, we use “Ra” to denote the aerodynamic resistance measured by the evaporation pan and eddy correlation system in equations (37-38). We will change to a better symbol in the revised paper.

References:


Hall, R. L.: Aerodynamic resistance of coppiced poplar, Agriculture and Forest Meteo-


