

Response to **Interactive comment on “Measurements of energy and water vapor fluxes over different surfaces in the Heihe River Basin, China”** by S. Liu et al.

Dear Anonymous Referee#1: We are very grateful for your review of our paper and give us very useful suggestions. We will try to take advantage of your advice for improving the manuscript. For an easier comprehension, your comments are also reported. We respond below to your comments item by item.

Referee#1: The authors also determined the source areas of the EC and LAS measurements but it is noticed that only one dimensional footprint analysis was performed. While this type of the analysis has been used frequently in similar previous studies, the assumption used in 1-D analysis is often not valid in a complex landscape; in particular this could be the case for the YK site when the winds would come from either the east or the west directions as shown in Fig. 2a. Recently Timmermans et al (2009) have developed a 2-D method for footprint analysis of LAS measurements, which can deal with situations with both stable and unstable conditions occurring in the footprint of the LAS. They applied the method to the Barrax site using the data reported by Su et al. (2008) and have shown that such an approach would be necessary to explain the observed fluxes in complex terrains. It would be interesting to know if these situations also occurred in the Heihe data sets.

Thanks for the referee's suggestions. In our paper, the source areas of the EC and LAS measurements were calculated based on the footprint model originally proposed by Kormann and Meixner(2001). For the EC measurements, the footprint model is actually similar to the one Timmermans et al. (2009) used and both of them are the analytic models indeed. In Timmermans's paper, a 2-D footprint model was achieved integrated with the relative contribution per running meters along the wind direction and the assumption of a Gaussian crosswind distribution function of the lateral dispersion, which is the same as the crosswind integrated footprint in our paper. If the vertical direction is also rendered as one dimension as the Timmermans's model, the both models can be regarded as a 3-D footprint model. For the LAS measurements, the footprint model was determined combining the point footprint function with the spatial weighting function of the LAS (Meijninger et al., 2002). Considering our sites (YK, GT) were moderate heterogeneous surfaces, it is acceptable to conduct these analytic models (our footprint model, Timmermans' method, etc.) for estimation of the relative contribution of the surface fluxes, although these analytic models are not as sophisticated as those non-analytic models in complex terrains (eg. Kljun et al., 2002, Sogachev et al., 2004).

Referee#1: Additionally it may be pointed out that there have been several recent studies on the comparison of EC and LAS measurements for different canopies, in particular those appeared recently in the HESS special issue (see Su et al., 2010; Su et al., 2009). It would be interesting for the authors to have a brief discussion on the difference and similarities of the findings in the

different studies compared to this present one.

Thanks for the referee's advice, we adopt it. In the Sec.3.3, there was a brief discussion on the comparison of EC and LAS measurements (P8759, L13-19). In the revised manuscript, we will add the recent findings of EC and LAS comparison in the Sec.3.3.

Referee#1: P5L2 mentioned "Watershed Airborne Telemetry Experimental Research (WATER)" (Li et al., 2009), but the reference Li et al. named it "Watershed allied telemetry experimental research". A consistent use of the names for the same experiment is desirable.

Thanks. We have checked the mistake, and will revise it in the revised manuscript.

Referee#1: Some of the references may need some further attention, e.g. P23L24, and "Hurk, V." should be "Hurk, B. J. J. M. v. d." although it is understood that some of the names can be quite complex.

Thanks. In the revised manuscript, we will revise the mistakes throughout the paper.

#### References

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