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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The von Kármán constant retrieved from CASE-97 dataset using a variational method" *by* Y. Zhang et al.

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This interesting and clear paper makes improvements upon estimation of the von Kármán constant using a variational approach. While there is always a question regarding what to hold constant and what to determine from the data, the present approach does not require the roughness length leaving the stability functions and the von Kármán constant as possible variables. Here, the von Kármán constant is treated as a variable and then sensitivity to the coefficients of the stability functions is investigated later.

Several questions arise.

1. Is the difference between kappa= 0.39 and 0.40 significant, considering the measurement errors?

2. Because the profiles are not linear, one might expect sensitivity to the choice of observation levels?

3. The imposed condition 0.35 < kappa < 0.45 probably strongly influences the results. Unless the distribution of kappa within this allowed range is strongly asymmetric, the mean value will be necessarily close to 0.40. Is it possible to put conditions on stability and/or nonstationarity instead of conditions on the von Kármán constant? I think some discussion would be helpful.

4. If I understand correctly, the majority of the stable cases are rejected by the restrictions on kappa. I think this is a very important finding. I agree with the authors that it is probably due to failure of Monin-Obukhov similarity theory, at least at the available observational levels. Since Monin-Obukhov similarity theory is generally applied in models to all conditions, further investigation of the frequent noncompliance cases would be valuable. Presumably the situation becomes rapidly more complex due to the influence of additional length scales. In addition, the relative insensitivity to the choice of the coefficients in the stability functions, found in the present analysis, probably breaks down. I realize this is a major task.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13667, 2008.

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Interactive Comment