

Interactive comment on “Aerodynamic roughness length estimation from very high-resolution imaging LIDAR observations over the Heihe basin in China” by J. Colin et al.

Anonymous Referee #2

Received and published: 28 June 2010

The subject of this study is interesting. Simulation of the aerodynamic roughness length over heterogeneous landscape and discussion of its interaction with wind flow will improve our understanding of the hydrological process over land surface.

This manuscript gives an example to how aerodynamic simulations can benefit from high resolution 3D surface structure model acquired by remote sensing. The result is promising but still with space for further improvement.

I have two major questions:

1. Treating trees and crops as solid blocks is a too rough approximation. This may

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be the main reason for the large difference between model simulation of wind speed and the measurement of AWS. Is it possible to give some simple consideration of the porosity of vegetation, and discuss about the result?

2. The roughness length derived from CFD is related to wind direction, but roughness lengths derived from other methods may not be related to wind direction. Which is more consistent to the meteorological or other studies?

Generally speaking, the manuscript presents new method to estimate roughness length as well as new data. But it is kind of roughly written. I would suggest the author put more effort to refine the manuscript.

Some other comments and suggestions are as follows.

3. In section 3.5, it is said “The AWS wind speed and direction measurements at 2 and 10m are used to initialize the profile”. Then, my question is that why the simulated wind speeds at AWS position and height are so much different from the initial value. Is there any data assimilation method can be helpful to bring the simulation close to initial value? I fail to find answer in the sentence in page 3407 “As quoted in Sect. 2, this is due to the solving of the transport equation”.

4. It is not clear how the atmospheric sounding data are used in CFD model, and what is its relation with AWS data. What is “PBL height”?

5. In Table 2, the date is 30 June and 14 July. But in Table 2, the date is 30 July and 14 June. Which is correct? Another question is why these specific date and time are chosen for study. I found it not understandable to choose 4 times in 30 June and 1 time in 14 July.

6. A major point in this paper is to use high resolution DSM in roughness length estimation. I wonder that if there is no high resolution DSM, e.g. using classification map from TM image to assign height value, how much will affect the result?

7. In Fig.3, what is the meaning of each sub-figure? Another question is has the

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edge effect been considered and removed? My expression from the figure is that the experiment area is very small.

8. In Fig.4, what does the number at X and Y axis mean? How large is the total area. Can the author give a true color image for the exact experiment area?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 3397, 2010.

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