Hydrology and Earth System Sciences Discussions

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.

J. Colin et al.

j.colin@unistra.fr

Received and published: 5 September 2010

Dear Referee, Please find below the answers to each of your comments and questions.

[Referee] Major comments: This is a very innovate and significant study. A majority of atmospheric/hydrological and remote sensing models needs aerodynamic roughness in the areal perspective. This paper gives a new approach. By using Lidar observation and compared with CFD wind profile computations, the results are basically good. However, the paper was a little rough written. Moreover, because of rather large differences of the roughness results by Raupach and MacDonald, also that from CFD, if a

validation with surface observations (as from tower & Eddy-covariance) could be done, it would be more significant.

[J.COLIN] Dear Referee, We agree that a validation is necessary. This couldn't be performed in time. However, we now have planed to work together with the team in charge of ground measurements with eddy correlation systems and LAS systems. Detailed investigations on the accuracy of model outputs and on the proper scale for comparisons with ground measurements should be published in the coming months. In particular, the next study pays a lot of attention to footprint analysis of ground measurements and spatial representativity of modeled roughness lengths for several case studies. This second paper should adequately complement this first paper.

Please also find below answers to minor comments.

[R] Minor comments: 1. P. 3400. DSM is not as familiar as DEM for readers. Please explain with a few words on its surface relevant parameters.

[JC] The paragraph was extended with further explanations.

[R] 2. Eq (1) is basic for this paper, esp. in using CFD wind profile in deriving z0m. However, it is valid only in neutral conditions. For some time in this analysis (mostly early afternoon), the stratification were very unstable.

[JC] Each case studies presented in this paper were tested to comply with the neutral stratification assumption.

[R] 3. P.3401. Is hv the canopy height? What used in Lettau's eq. (2) should not be same. Please give a description at first as for λf by eq.(3)?

[JC] hv cannot be considered as the 'canopy height', strictly speaking. hv is an effective averaged obstacle height. To some extent, a LIDAR measurement is an averaged measurement of the height within the surface of the spot on the ground. However, in the specific case of a vegetation canopy, the entire fullwave form of the signal should be used instead of the first and last impulse, to account for the vegetation vertical

structure, and derive an effective canopy height. At present, only the first and last impulse of the LIDAR measurements are available. We have changed "hv" to "h" to avoid any confusion.

[R] 4. P.3401-02. It is rather confusing for many readers to understand eqs. (4)-(9). There are many parameters and/or expressions that need a little more explanation. The value for $(u*/U)max$, '0.193,0.003,0.3,and 7.5a', and the description in last paragraph of these pages, are not clear.

[JC] The text was reshaped following your recommendations.

[R] 5. P.3405 & related. Some comparison with surface observation is more reliable. e.g., the area for dense vegetation can be get from surface information.

[JC] We will include this aspect in the validation study.

[R] 6. P. 3408 & related. Uncertainties seem more in using CFD-Windstation approach.

[JC] This is mainly due to the difference of spatial resolution between the two approaches (100 meters for geometrical approaches, 25 meters for the CFD approach), leading to smooth the highest measurement points.

[R] 7. There are many places with careless English writing or typing. Please have a careful check. For instance: P. 3400, line 20-21 P. 3401, line 3. P. 3402, line 7-8 P. 3403, line 18 P. 3404, line 19 & 21 P. 3405, line 18 Table 2 & 3: Month-dates are not consistent. Fig.5: Roughness in 'cm'? etc.

[JC] I would like to apologize for the poor english of the paper. We carefully worked on the text again, and hope this new version will give satisfaction.

We wish to thank you for your interest in our paper and your detailed comments.

With our best regards,

J.Colin, R.Faivre and M.Menenti

<div style="border-top"></div>

C2139

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