Review of manuscript: bg-2014-512-manuscript-version4.pdf
Title: " Large eddy simulations of surface roughness parameter sensitivity to canopy-structure characteristics"
Submitted to: Biogeosciences Discuss., 11, 16349–16389, 2014


## General Comments

The authors accomplished an improvement of the manuscript by the revision.
However, there are still some points to clarify (see below the remarks on Fig. 4) and minor corrections necessary. The discussion section contains repetitions and could be written more concise.


## Specific comments and technical corrections

The following comments are indicated by page and line numbers of this manuscript; whereas, for better readability, the page number was reduced by 16000 (e.g. P350L21 indicates page 16350, line 21). Recommendations are led by an arrow '→'.

P5L12:  → "In brief, MOST describes the functional relationship between surface stress and the parameters $d$ and $z_0$ and wind speed using a logarithmic function" – This sentence disguises the physical background. It is rather the integral form of the flux-gradient relationship using the parameter $z_0$ and $d$ to parameterize the unknown offset in $u$ and $z$ respectively). Check the consistency with the first sentence of the paragraph.

P7L8:  "distance" → "range"

P7L5:  →Please, shift the sentence "We determined the effective aerodynamic canopy height, $h_a$, by identifying the height of the inflection point in the vertical wind-speed profile. This height marks the transition between the sub-canopy and above-canopy flow regimes (Thomas and Foken, 2007b)." from P11L8 into this paragraph.

P10L16:  → delete "at that height level"

P13L15:  "A 'Biometric' $d$ was then calculated using Eq. 10." How is this done? Did you use Eq. 11 instead?

P13L10:  "We calculated a 'Biometric' $h_a$ using the relationship we found …" → "We calculated a 'Biometric' $h_a$ for the US-UMB site using the relationship we found …"

Eq. 13 shows the same relation as Eq. 7

P16L19:  "parameter" → "parameters"

P17L2:  "figure" → "Figures"

P19L9:  "placment" → "placement"

P21L11-13:  The sentence has got no verb.

P21L14:  "'Classical' approach" or Nakai et al (2008)?

P21L23-26:  "The 'Biometric' method … adding small perturbations to displacement height based on LAI and gap fraction… " – Using Eq. 11, the displacement height depends only on $h_{max}$. What influence have LAI and gap fraction on $d$?

P21L28:  "We predict that this method will significantly improve the prediction of friction velocity…" – On what basis did you make this prediction?
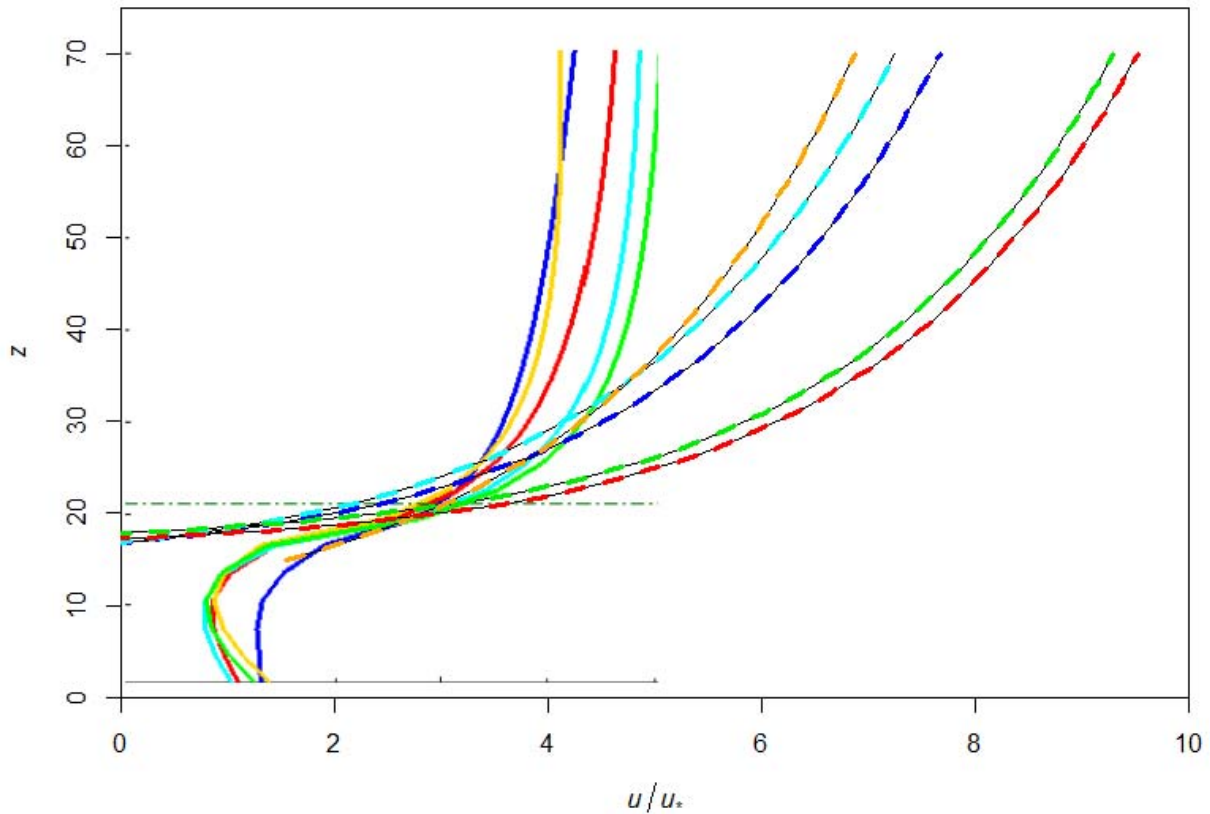

## Figures

I found no reference to Fig. 4 in the text.
Fig. 4a: Those are still strange profiles showing very low normalized wind speeds.
Considering neutral cases, the shape of the profiles should resemble the form $u/u_* =$

$1/0.4*\ln((z-d)/z_0)$. Assuming $d = 15$m, one would need $z_0 > 5$m, to reach $u/u_* < 5$, within a height of 50 m. $z_0 = 3$m results in $u/u^* = 6.1$!

Using the $d$ and $z_0$ values given in Table 1 and omitting the influence of the roughness sub-layer, I calculated the dashed lines within the following figure for the wind profiles above the canopy.



The straight lines in the background show the LES results, i.e. a copy of Fig. 4a. Did you fit Eq. 1 to the profiles shown in Fig. 4a to derive the results in Table 1? If yes, what are the reasons for the differences in the figure above?

Fig. 4b, 5b and 7b: How do you explain the differences between lines of the normalized momentum flux within the inertial sub-layer (above ~50 m)? Shouldn't they collapse to one line, i.e. the value -1 there?