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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A semi-analytical solution for the mean wind profile in the Atmospheric Boundary Layer: the convective case" *by* L. Buligon et al.

Anonymous Referee #1

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The manuscript deals with a derivation of the wind profile from the Navier-Stokes equations, accounting for large scale flow divergence and vorticity. The derivation is based on the GITT-method. The description of the model equations in chapter 2 is clear and transparent (2.1 basic equations; 2.2 boundary and interface conditions).

1. However, chapter 3 on solutions is too long and the overview of the manuscript is lost. I suggest to shorten and move large parts to an appendix.

Wind profile simulations using the new method are compared to day 33 and 40 of the Wangara experiments.

2. With respects to day 33, then the agreement with the measurements is poor, al-

though it is stated in the manuscript that "are similar to those observed". A discussion on the differences in the observation and model prediction and some possible explanations for the differences should be offered in the manuscript.

3. I also note the pronounced differences in the vertical gradient of the wind speed near the top of the boundary layer; the models seems to have a very pronounced positive gradient (du/dz) but the measurements have a negative gradient. This deserves a thorough discussion. It can be noted that for barotropic conditions the geostrophic flow is constant with height above the boundary layer corresponding to zero wind speed gradient at the top of the boundary layer.

4. Similarly for Wangara day 40 (Fig. 4, the figure legend tells day 33 but this must be a mistake). Again the wind speed gradient (du/dz) of the simulated wind profiles is very large near the top of the boundary layer for all combinations of divergence and vorticity, but the wind speed gradient of the measurements is small. Please comment.

5. The tables with quality indices are not useful without an explanation of the indices and a thorough discussion of the numbers in the tables. This should be added to the manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 19817, 2009.