

## ***Interactive comment on “Turbulent dispersion in cloud-topped boundary layers” by R. A. Verzijlbergh et al.***

### **Anonymous Referee #2**

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The paper describes dispersion of passive tracers in four different types of the boundary layer, namely, with forced convection generated by (i) the surface heat flux, (ii) the dust layer at the top of the ABL, (iii) Sc-clouds, and (iv) the Cu-clouds. The paper is well written, and I have only a few specific comments, which are listed below:

1) Case description: Information about the geometrical limits of the dust and cloud layers could also be included in Table 1. In the Cu case,  $z_i$  is the lower limit of the boundary layer, while the secondary turbulence is developed in the cloud layer, above  $z_i$ . Consequently, Figure 1d should probably be modified to include convection in the cloud layer.

2) Is the correlation function  $R$  in Eq. (11) dependent on  $t$  and  $\tau$ ?

3) Page 19648, line 1: "The evolution of the plume", or "The evolution of the cross-wind integrated plume"? Describe how Figure 3 was obtained. Is it obtained by horizontal (xy) averaging?

4) Page 19648, line 8: "looks resembles"?

5) Page 19648, line 18: A point should be made that the discussion refers to horizontally averaged results within the cloud layer, so the cloudy regions are averaged together with cloud-free ones.

6) Eq. 12: The Brunt-Vaisala frequency is usually defined without  $2\pi$ , see: [http://en.wikipedia.org/wiki/Brunt-Väisälä\\_frequency](http://en.wikipedia.org/wiki/Brunt-Väisälä_frequency)  
<http://amsglossary.allenpress.com/glossary/search?id=brunt-vaisala-frequency1>

7) Figure 5: Specify the level for which the plot was made.

8) Figure 6a: Specify the level for which the plot was made.

9) Figure 8a: Specify the level for which the plot was made.

10) Figure 10a: Specify the level for which the plot was made.

11) Figure 11: Describe how Figure 3 was obtained. Is it obtained by horizontal (xy) averaging? Is the figure made for only cloud covered regions?

12) Figure 13a, specify the level for which the plot was made. Is the figure made for only cloudy regions? An explanation should be provided, why the distribution is symmetric.

13) Figure 13b: Define the meaning of the "distance to the cloud", i.e., to its center, or to the borders. Is the figure made for only cloudy regions?

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 19637, 2008.

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