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Interactive comment on "Turbulence Induced Cloud Voids: Observation and Interpretation" *by* Katarzyna Karpińska et al.

Anonymous Referee #4

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The paper presents field experimental observation of the so defined "cloud voids" and attempts to provide physical mechanism for this phenomena based on the simple model of inertial particle expulsion from strong, thin coherent vortices, using burger Burger vortex as model.

The field observation of the cloud voids is in itself new and interesting and worth disclosing. However, the link to expulsion from coherent vortices is, although plausible, not as convincing as suggested in the Abstracts and Conclusion of the paper. I would recommend a somewhat weaker conclusion unless more work is done to strengthen this interpretation. In relation to this and other weaknesses, below are my detailed comments:

1. According previous works such as the cited Mouri et al (2000), coherent intense

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Discussion paper

vortices are observed to have diameter not more than about 20 times the Kolmogorov microscale (as reported by Mouri et al.). This is consistent with the authors' own survey as they wrote "proportionality constant in Eq. 1 is in the range m âĹĹ [3.5, 24]". Their observed void size (centimeters) in this report is however about a hundred times the corresponding Kolmogorov length (see Table 1.). This calls for an explanation. E.g. are larger vortices expected in atmospheric conditions?

2. As the authors stated, these coherent vortices are "severely intermittent". What could be said on the prevalence of the observed voids at the site? And could this be reconciled with known intermittency, perhaps in terms of "large-scale organization of the small-scale intermittent structures" ?

3. Ideally, it would be very helpful, if the velocity or vorticity field around the observed void is also concurrently estimated if not measured. If that is not the case, it would be helpful to establish the presence of intense vortices, long lived enough and having similar diameters under similar conditions, at the site.

4. The Stokes number used in simulation 1) is St=1.45. I was hoping to see St similar to the experimental value (similarly for S_v) for a better comparison (is this not the purpose, why?, in any case I recommend that). In relation to this, I don't know if it is meaningful to claim "visible void radii are rather âĹij 2-2.5 cm, which seems close to the experimental values" (line-4, pg.16) when parameters are not matched.

5. I have difficulties understanding Figure 5 and the corresponding explanation in the text. In particular, I am not sure how to interpret the dashed-lines. Better exposition is welcomed here.

6. Line-15, pg 16: "Comparison of the modeled and observed voids led ....". observe refers to the field data or the "visible void" in the simulation?

7. Line-4, pg.16 : "0-1.5 cm; however, ...". Is zero a typo here?

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