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Interactive comment on "Quantifying the effect of aerosol on vertical velocity and effective terminal velocity in warm convective clouds" *by* Guy Dagan et al.

Anonymous Referee #2

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Review of the study "Quantifying the effect of aerosol on vertical velocity and effective terminal velocity in warm convective clouds", authored by Guy Dagan, Ilan Koren, and Orit Altaratz

The study is dedicated to analysis of general properties of a warm cumulus clouds on aerosol loading. The analysis is performed in the terms of Center of Gravity (COG) behavior. It is shown that aerosols induce cloud invigoration, and that the effects are maximum at the developing cloud stage.

The paper is of interest. The approach to the analysis is original. The study is recommended to publication with minor revisions.

The comments and remarks are listed below.

Line 13. Which processes do you mean? Trends of which? Be more specific.

line 75. Clarify, what is "clean precipitation conditions".

line 94. Why does mixing increase? Seigel (2014) explains this effect by stronger evaporation of smaller droplets in polluted cases.

line 99. Do you mean accumulated rain at the surface?

line 102. The sentence is not clear. What does a "correlation between aerosols and cloud properties" mean? Be more specific.

Line 110. What do you mean presenting the references? How is the study by Grabowski et al., 2006 related to the COG behavior?

line 115. Can you comment the choice of the model? The axisymmetric model may have problem because rain mass (mass loading) is located in the cloud center substantially decreasing updrafts. Such configuration may decrease the generality of the conclusions, because even small wind shear may form a moment between updrafts caused by buoyancy and downdrafts caused by mass loading and other factors.

line 119. Tzivion et al. refer the method they developed to as microphysical method of moments (MMM). The name "two-moment bin method" is somehow confusing, because alternative SBM method used in SAM calculates size distribution functions and the values of any moment of DSD in each bin.

line 135. The sentence is not clear. Results certainly should depend on inversion-base heights, and RH in cloud layer.

line 151. The title is not suitable, in my opinion. The simulations with a single cloud model discussed in section 2.1 is also LES. The authors, supposedly, want to stress that in SAM they simulate cloud

line 165. How were the mean values calculated? Over entire cloud?

line 196. Can you comment the potential effect of the fact that the model used is axisymmetric? The effect of wind shear should be very significant.

line 209. Please clarify what is "weighted by the liquid water mass". Please present expression used for the calculation.

lines 213-214. Saleeby et al. and Seigel use RAMS bulk parameterization scheme. Do you suppose that this scheme describes increase in the latent heat release by the increase in aerosol loading?

Conclusion section. It would be important to add a discussion about the applicability of the results to evaluation of aerosol effects on radiative cloud properties, on precipitation amounts, etc.