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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Basic convective element: bubble or plume? A historical review" *by* J.-I. Yano

Anonymous Referee #1

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I have a problem with this manuscript. This is a short story on simplified models of convective elements in application to formulation of mass-flux parameterization of moist atmospheric convection. The story can be useful to many readers. In particular a summary in the final section entitled "Future perspectives..." presents interesting views of improvements in convection parameterizations. On the other hand the paper is too compact. Some important elements are only briefly stressed and not explained. The "added value", which is an important part of any review paper is accessible only to the reader who already has a relatively good understanding of the subject. Understanding and meaning of critically important terms "entrainment" and detrainment" is not discussed here. I recommend major revision of the text to clarify terms used and explain more details.

Major comments:

Abstract

It should be clearly stated that the problem refers to atmospheric moist convection, i.e. convective clouds.

2 Bubble

Explain, please, bubble and/or circular vortex ring in more detail. Illustration of circulation inside a bubble and explicit presentation of Levine's formulation will be useful.

3 Plume: entraining plume model.

Again, sketch of the plume in stratified of the environment will be useful to understand objections of Morton.

4 Observations, 5 Historical....

Entrainment problem: why Stommel's point of entrainment does not agree with entrainment observed in water tank? Be specific, please, give examples. This is a very important part of the text. "Entrainment" and "detrainment" are poorly determined, these terms are related to transport across certain imaginary borders/interfaces. These ambiguities can be explained here.

Sketch explaining cloud top entrainment and penetrative downdrafts vs lateral entrainment would help, the same refers to buoyancy sorting concept.

3346 In the quotation from Morton (1997b) there is notion of jet. Explanation of difference between plume and jet is necessary.

6 Buoyancy parameter

3347 18-22 Some aspects of initial velocity/buoyancy (of thermal rather than plume) are discussed in Sànchez, Odòn, David J. Raymond, Larry Libersky, Albert G. Petschek, 1989: The Development of Thermals from Rest. J. Atmos. Sci., 46, 2280–2292.

3347 22 and following I cannot agree with the statement that initial velocity of the plume is virtually nonexistent. The problem relates to organization of convection in the ABL. There is of course ambiguity related to initial plume size parameters in given conditions, but it is not justified to expand plume concept plume to the limit of zero velocity or of zero cross-section area.

Minor remarks:

3338-10 - parapetization :)

3343-4 – “plume theories were steady with time”

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 3337, 2014.