

## ***Interactive comment on “Characteristics of the raindrop distributions in RICO shallow cumulus” by O. Geoffroy et al.***

### **Anonymous Referee #1**

Received and published: 4 March 2014

This study examines the raindrop size distribution for precipitating shallow cumulus, using in situ observations from RICO campaign. The vertical variation of raindrop size distribution due to microphysics processes are documented in this study. As reference for future determination of shape parameters in the raindrop spectrum, relationships between the shape parameters and rain water content and number concentration are proposed. The results from this study are valuable because such characteristics of precipitation have rarely been discussed for shallow cumulus, and an accurate representation of raindrop spectrum can help better simulate the shallow precipitation processes in models.

This paper should be accepted after some revisions. Improvements should be made to the figures and the writing, for a better presentation of the results.

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#### Major comments:

1) The figures are difficult to interpret due to their poor quality.

a) Box plots are used in most of the figures for representing 5, 25, 50, 75, 95 percent of the data. But, this information was rarely used in the discussion.

b) Figure 2 seems gigantic for the amount of information it actually conveys. The color symbols are difficult to read, and they are barely mentioned in the discussion. I don't see much necessity of having the color symbols in the figure. In section 2, the authors mostly discuss the vertical structure/trend of the variables that are buried in the current Figure 2. There should be a better way to make this figure more clear, and consistent with the discussion.

c) In Figure 3, it would be interesting to see how the  $qr-N_r$  relationship different at various altitudes. Maybe color code each data point by their altitude.

d) Figure 5, please label each plot, since they are referred to in the discussion as Figure 5a, b, c, d. . .

2) As I understand, the moment 1, 2, 4, and 6 are used in this analytical study because each of them is associated with a physical process during the raindrop evolution. However, the strength of such analyses is weakened since the physical processes associated with the moments are not consistently discussed through the paper. In fact, they are only briefly mentioned in line 24-26 of section 2.

3) The overall language is not fluent and precise enough for a good presentation of the scientific results.

#### Minor comments:

1) Page 678 line 6, “This study focuses on shallow cumulus rain distribution at every level in the cloudy boundary layer”, “every level ” is a obscure term

2) Page 679 line 9, this sentence is supposed to explain “raindrops are sorted by size”,

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how about “because large drops fall faster, the raindrop distribution tend to favor larger drops at lower levels”

3) Page 670 line19, add “,” between p and Mp

4) Page 683 line 5, seems to me there is no need to use abbreviation for “section 3”

5) Page 683 line 10, “raindrop spectra used in that study”, which study?

6) Page 683 line 16, “assume that the diameter is the drop height”, not sure what does this mean

7) Page 685 line 13- 14, could you provide a reference or two for such LES simulation study?

8) Page 688 line 27-29, the structure of this sentence and the use of the parentheses have weakened the emphasis of the short sentence currently in the parentheses. It might be better to remove the parentheses, and rephrase the whole sentence.

9) The abbreviation “i.e.” is overused throughout the paper, some of them are inappropriate, such as page 682, line 17. Please consider rephrase many of the sentences that contain “i.e.”.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 677, 2014.