

## ***Interactive comment on “Climatological characteristics of raindrop size distributions within a topographically complex area” by S.-H. Suh et al.***

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Interactive comment on “Climatological characteristics of raindrop size distributions within a topographically complex area” by S.H. Suh et al.

Title: I think that the "Busan" and/or "Korea" should be inserted in the title.

A. Thank you for your comment. Actually, I want to emphasize the topographical conditions of Busan area. Of course I fully agreed with your comment. Therefore, I will consider your kindness comment.

Page 4006, line 12: Please define Dm

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A. Thank you for your comment. I did not consider the definition of mass weighted raindrop diameter (Dm). I'll add the definition of it. Thank you.

Page 4006, Lines 19-22 (minor remark): Even if DT and NT are well defined, the reader thinks about diameters and concentrations...

A. Thank you for your comment and I am so sorry to confuse your comment. As I understand, there is some need to additional explanation for the characteristics of rainfall during daytime/nighttime. However, the information relative to the characteristics of DSD for a daytime/nighttime is already explained in hereinbefore (Page 4006, Line 16-17: we observe maritime (continental) precipitation during the daytime (DT) (nighttime, NT), which likely results from sea (land) breeze identified through wind direction analysis.). This sentence would be sufficient to explain the feature of daytime/nighttime as my point.

Page 4006, Line 24: DSD doesn't control microphysical processes. It's the contrary.

A. Thank you for your comment. Your comment is absolutely right and it is typing error. I will modify the this word 'control' to 'is controlled by'.

Page 4007, line 6 and for each following equations: Please precise the units.

A. Thank you for your comment. I will add the unit values of rainrate (R, mm h<sup>-1</sup>) and raindrop (D, mm). Thank you.

Page 4010, equation 4: The numerator has to be reversed with the denominator.

A. Thank you for your comment and i'm so sorry to make you confused. There is no problem in the sentence (Page 4010, Line 1-2 : Mass-weighted mean diameter (Dm) is calculated as the ratio of the fourth to the third moment of the DSD), but the equation (6) is reversed as you told. However, there is no problem in the program code and I will modify the equation word.

Page 4010, equation 9: D3 and v(D) are missing !!!

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A. Thank you for your comment. As you told, I miss the two parameters ( $V(D)$  instead of  $\rho_w$  and  $D^3$ ). However, there is no problem in the program code. It is typing error. Also, I will modify the equation as you told. Thank you.

Page 4011, line 14-15: I do not understand the second quality control.

A. Thank you for your comment and I'm so sorry to make you confuse. The 2nd quality control of POSS disdrometer is as follows; 1-min DSD data which exist in the data 34 channels must exist not only larger than in five channels but also this data is consecutive (e.g., This DSD data is considered to remove: Only 1-min DSD data existed in No.11, No.12, No.13, No.14 channels is removed.). Also, If 1-min DSD data only exist smaller than 5th channel (No.5) or larger than 10th channel (No.10), it is considered to non-atmospheric data and removed.

Page 4011, line 18 and Page 4013, line 10: Several thresholds on R and Dm are used. It is therefore very important to indicate on what timestep R is computed and for what timestep R and Dm are used in the cited literature.

A. Thank you for your comment. I miss the timestep of R in page 4011, line 18. And I already explained the timestep of R in the page 4013, line 10 as 1-min temporal resolution. I used the 1-min temporal resolution DSD data in present study at the page 4011, line 18. And, I'm so sorry I did not understand of Dm.

Page 4011, Some more explanation and reference about the POSS are missing. Moreover, I wonder how is the accuracy of POSS observations in presence of strong winds (typhoons)

A. Thank you for your comment and I absolutely agree with your idea. I miss the explanation of characteristics and structure of POSS disdrometer. According your comment, I will add the information of POSS disdrometer more detail. Of course the disdrometers depend on the wind effect including POSS disdrometer. Sheppard (1990) and Sheppard and Joe (1994) noted some shortcomings as the overestimation of small drops at

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winds larger than 6 m/s. However I did not consider the wind effect in present study because of beyond the research bound. Therefore I did not explain and proceed the quality control of POSS data relative to the wind effect. As consider your comment, I will consider to add the shortcomings of POSS for wind effect in this sentence.

Page 4011, Line 28, and Figure 3: The graph and the written values on the graph seem to be not consistent.

A. Thank you for your comment. I explained the accumulated rainfall as round half down value (4269 mm) for simplification of main sentence. Also, detailed value of accumulated rainfall value is could find in the Fig. 3 (4269.060 mm). However, as consider your comment, I'll modify the value precisely.

Page 4012, line 10: I didn't find the reference to Hamilton in the list of references. Moreover, a threshold of 0.5 mm/h for average 5min rainfall intensity seems to me very low!

A. Thank you for your comment. In the previous paper (Johnson and Hamilton, 1988), you could find the threshold of classifying the rainfall type in page 11 line 19-21 of right side.

Page 4013, line 8: "Gamadre" should be replaced by "Gamache"

A. Thank you for your comment and I will modify the name as you told.

Page 4014, line 3: Units are wrong (replace by mm)

A. Thank you for your comment. It is an accumulated rainfall amount (mm) not rainfall rate ( $\text{mm h}^{-1}$ ). Thank you and I will correct the unit value as you told.

Page 4014, line 21: "The distribution of  $\mu$ : : is more frequent", this kind of sentence is not clear. The following sentence seems to be contradictory with the previous (I'm not sure).

A. Thank you for your comment and I'm so sorry to make you feel confused. the word

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'more frequent' means ' $\mu$  has more value of PDF for convective rainfall type compared to those of stratiform rainfall when  $\mu < 0$ .' Also you could find the results of this in Fig.4(a). Thank you.

Page 4015, lines 19, 20 and 23: Units for log-transformations should be removed

A. Thank you for your comment, I will remove the unit of log values ( $\log(N_w)$ ,  $\log(R)$ ,  $\log(LWC)$ ).

Page 4015, line 21-22: What is the usefulness of this information? In fact, the PDF curves are crossing each others on each graph and they usually have therefore some common values.

A. Thank you for your comment. Actually, PDF result would be show the many kind of feature of each parameter. What I want to say in this sentence is that the value of  $\log(N_w)$  4.4 is able to the threshold of classifying the rainfall type (stratiform, convective) in this case. The present paper use the almost 4 years DSD data, Therefore, this explanation consider a reasonable assumption using statistical method.

Page 4015, line 28 and Page 4016, lines 12: I don't understand totally this sentence. Is the beginning of the sentence necessary?

A. Thank you for your comment and I'm sincerely sorry to make confusing you. What I want to say is similar to the previous question. The PDF distribution of rainrate for convective rainfall type larger at  $\log(R) > 0.65$  than those of stratiform rainfall. Also this distribution has a peak value at the  $\log(R) = 0.9$ . To avoid confusing by reader, I will modify the sentence more detail.

Page 4035, I think that graph (b) is not easily readable. Maybe the authors may zoom on  $1 < D_m < 2$  mm?

A. Thank you for your comment and kindness. Originally, I considered the show the detail (zoom-in) distribution of each mean parameter as you told. However, the purpose of present study is to show the dominant characteristics of DSD in Busan area.

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Therefore, I did not add the zoom in image in Fig.5(b). Also, The point in the present study is not Fig.5 but Fig.6. You could see the distribution of each mean parameter in Fig.6.

Page 4017, line 18, I think that the sentence beginning with "The distribution of 1min: : " could be the beginning of a new paragraph.

A. Thank you for your comment, As consider your idea, I will dividing to new paragraph.

Page 4018, the last lines about the disagreement with Chang and al. (2009): My personal point of view is that the scale of a typhoon is large and the characteristics of DSD certainly differ according the location inside the typhoon and/or the development stage of the typhoon.

A. Thank you for your comment and I considerably agreed with your idea. If the research study is case study of typhoon, characteristics of DSD in typhoon case for each position would be the most important issue. However, the present study is the statistical research study. Therefore, I only touched the entire typhoon case data observed in Busan area to find the dominant characteristics of DSD.

Page 4019, line 24: Could you add a reference for "Nw generally varies inversely to Dm" ?

A. Thank you for your comment and I'm so sorry for that I can not find this sentence in page 4019, line 24 but I found the same sentence at page 4018, line 24. Actually, I did not feel the necessary to add the reference of this. Because in Fig. 5 and Fig. 6 shown the inverse proportional relation between  $D_m$  and  $N_w$  in present study. Also, previous result (Bringi et al., 2003) shown the feature as similar to the present study. Therefore, I thought that adding the previous reference in this sentence is the repeated expression.

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