

Interactive comment on “Characteristics of precipitation system accompanied with Changma front at Chujado, Korea, 5 to 6 July in 2007” by C.-H. You et al.

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Dear Editor,

We are grateful to the referees for their helpful comments, which would be carefully considered in preparing our next revised manuscript. The manuscript has been revised following the comments of the referees. The purpose of the paper has been made clearer, unreadable figures were changed and conclusion has been changed briefly. English grammar has been re-checked and mistakes have been corrected. The modifications made in the revised manuscript following the suggestions of the referees' are given below and supplement.

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I hope you will find the paper acceptable for publication in the Hydrology and Earth System Sciences.

Best regards, Dong-In Lee

Response to the comments of Referee #2(C407-410)

General Comments

Referee's comment: In the introduction, the main scientific motivations of the paper are not clearly explained and described. What are the scientific questions that the paper aims to address? Why are they relevant? The whole paper is a bit fuzzy to this respect: it appears more like a list of values of different meteorological variables in this particular area than a paper tackling a precise research question.

Response: The observational studies are focused on the mesoscale or smaller scale characteristics of precipitation system accompanied by Changma front have been rarely done. Therefore, we focus on the mesoscale features of rainfall system using weather radar, disdrometer and radiosonde data. And our purpose is to analyze the three rainfall systems within precipitation system maintained for 22 hours. Therefore, we describe the values of different meteorological variables in this study.

Referee's comment: The authors tend to draw conclusions about the local mesoscale characteristics of the rainfall associated with the Changma front over south Korea from data with limited representativity: in particular they use DSDs from one POSS, so about a few m³ sampling volume, and measurements from radiosoundings (local profile). Moreover, the authors focus on 3 rain events (from the same rain system more or less). The representativity of these rain events for the local climatology must be established (or at least discussed).

Response: It is less representative for explaining whole of Changma front. However, there have been rarely studied on the mesoscale features of rainfall system accompanied by Changma front up to now. We tried to find out the characteristics of rainfall

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system more detail in a view of mesoscale and smaller scale as mentioned above response. This paper will give new aspects on characteristics of Changma front precipitation systems for further study. Specific Comments

Referee's comment: Page 1527, line 1: to clarify the meaning, I suggest to add "using the same relationship as" between "... from the reflectivity" and "(Biggerstaff and Houze...".

Response: We corrected.

Referee's comment: Page 1527, line 16: the authors should indicate what $u, v, \hat{r}, \hat{E}, j$ denote. k is the vertical layer index I presume... Units should be also given.

Response: We corrected.

Referee's comment: Page 1527, line 21: it should be N_0 instead of N . Please indicate the units of the variables.

Response: We corrected.

Referee's comment: Page 1528, lines 8-11: it is not clear how the three rain events have been categorized or selected.

Response: We added as follows; "Using animated weather radar images, rainfall system in case1, case2, and case3 moved from north-west to south-east, west to east, and north-west to north-east, respectively".

Referee's comment: Page 1528, line 24: Jejudo is not indicated on the map in Figure 1.

Response: We added Jejudo in Figure 1.

Referee's comment: Page 1529, line 9: please define the K-index (or give appropriate references).

Response: We added description on the meaning of K-index

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Referee's comment: Page 1530, lines 28-29: it is not obvious (at least to me) to identify the differences in the number of drops larger than 2 mm in the three panels of Figure 11. Moreover, why highlighting this value of 2 mm?

Response: It is not exact 2 mm in diameter. We changed "2 mm" to "around 2 mm". If you take a look at the raindrop distribution of each case, we believe that you can find the intersection of number concentration with each case.

Referee's comment: Page 1531, line 3: by definition, the gamma DSD model exhibits an exponential tail, so nothing surprising there...

Response: We removed those description

Referee's comment: Page 1531, line 5: again why focusing on this particular value of 2 mm for the (equivolumetric) drop diameter?

Response: Yes. Referee is correct. It is not exact 2 mm in diameter. We changed "2 mm" to "around 2 mm". If you take a look at the raindrop distribution of each case, we believe that you can find the intersection of number concentration with each case.

Referee's comment: Page 1531, lines 11-16: the units in which the DSD parameters values are expressed should be given (mentioning the fact that the shape parameter is dimensionless).

Response: We added them in the text.

Referee's comment: Page 1531, lines 12-14: I do not understand this sentence.

Response: In the gamma model and observed DSDs, there is difference of number concentration in the smaller drop channel. We think this is a little confused. Therefore, we changed "of next size bin" to "gamma model".

Referee's comment: Page 1531, line 17: the authors should explicitly present the link between these characteristics of the rainfall DSD and the description of the warm and cold convection previously given in this section. To my opinion, this could be the inno-

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vative part of this paper that could be worth publication. But this requires to significantly improve this section...

Response: We cannot explain and verify the relationship between warm/cold advection and rain drop distribution clearly at this moment. However, we think that the possibility of the relationship between temperature advection and rain drop distribution was shown. Text is revised to emphasize the possibility.

Referee's comment: Pages 1531-1532: this is not a summary! The details should go in Section 3, and only the main features should be mentioned in Section 4.

Response: According to comment, we made necessary correction.

Referee's comment: Page 1536, Table 1: the caption must explain what is given in the table. In addition, the units should be given.

Response: We added the unit.

Referee's comment: Figures: the pictures are of bad quality and barely readable in general.

Response: We improved the quality of the figures.

Referee's comment: Page 1538, Figure 1: the location of the POSS is not indicated on the map.

Response: We added the location of the POSS in Fig. 1.

Referee's comment: Page 1542, Figure 5: unreadable!

Response: We improved the figure.

Referee's comment: Page 1543, Figure 6: why do the profiles in panel b stop at about 10 km, while the profiles go up to 15 km in the other panels?

Response: There was data errors above 10 km in the radio sonde. In order to show the confident data, we changed the height of the analysis up to 8 km at all cases.

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Referee's comment: Page 1545, Figure 8, panels b and d: the color scale is not appropriate. There is "saturation" between 15 and 20 km (x-axis).

Response: We tried to make all color scales (-14 to 14 m/s) of the vertical velocity on the dual Doppler analysis same in order to explain three cases with same sense.

Referee's comment: Page 1548, Figure 11: the legend of the color bars on the right of the pictures are not readable.

Response: We elongated the color bars to be readable.

Referee's comment: Page 1549, Figure 12, upper picture: the blue line (case I) has a strange sharp decrease (starting from $D=0.5$), what is it?

Response: That is real data from observed DSD. We think that its number concentrations was abruptly decreased though the accuracy for small raindrops are less.

Please also note the Supplement to this comment.

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