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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Parametric representation of the cloud droplet spectra for LES warm bulk microphysical schemes" *by* O. Geoffroy et al.

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We thank the Referee #2 for his comments and suggestions for improvements.

- Scientific comments 1, the data sets.

We take in account the suggestions and propose to add the following details in section 5:

p 17642, L20: "Both are international field campaigns during which the quality of the microphysical measurements, among others, has been carefully assessed and dis-

cussed during the post-campaign data workshops. Data from other international field experiments on warm convective clouds, have also been examined, such as SCMS in 1995 and DYCOMS-II in 2001, which corroborate the results presented here.

The droplet spectra were measured with the Fast-FSSP, a droplet spectrometer that covers a range from 1 to about 20–25 μm in radius (Brenguier et al., 1998). This improved version of the standard Particle Measuring System (PMS) FSSP-100 is presently the most accurate for measurements of the droplet spectra, both in term of number concentration and droplet sizes (Burnet and Brenguier, 1999, 2002)"

P 17643, L4, we add the following sentence at the end of the paragraph: "This also indicates that the results presented here are not strongly affected by the uncertainty in the OAP measurements which is very large for particles of radius lower than 50 μm (Lawson et al., 2006).

- Scientific comment 2, p 17646, L18-20.

We don't understand this comment. Accuracy is a statistical measure and the estimators presented here are characterized by their bias and dispersion (arithmetic mean and standard deviation) for the absolute error, (geometric mean and standard deviation) for the relative error. Both therefore statistically integrate the fact that data points are scattered. The remaining issue would be to check that individual errors follow a Gaussian distribution for the standard deviation to be useful, but we doubt that this is what the reviewer is suggesting.

- Scientific comment 3, Section 7.2.

The focus of this paper is on bulk parameterizations which, to our knowledge, use either LWC as a prognostic variable (one-moment schemes) or LWC and droplet number concentration (two-moment schemes). To be useful, parameters can only be optimized

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using model prognostic variables. We therefore tested the dependency of the parameters to these two prognostic variables. While there is an obvious trend with LWC, the droplet number concentration does not allow improving the accuracy of the parameters. We therefore propose to modify the sentence as:

"In a second step, we explore the potential of diagnosing the tuning parameter, using the prognostic variables of a bulk parameterization, i.e. N or q_c. The tuning parameter shows a noticeable sensitivity to q_c, and almost no sensitivity to N. The sensitivity to q_c is illustrated in Fig. 5 that is similar to Fig. 2, except that the x-axis now represents the LWC."

- Technical comments.

We propose to replace the two first paragraphs by the following:

"Figure 2 summarizes the analysis. The upper three rows show scatter-plots of the tuning parameters values for the four moments, from left to right, for the Lognormal parametric function in a) and for the generalized Gamma function with α=1 (GG1) and α =3 (GG3) in b) and c), respectively. For each observed spectrum the moment value is reported on the x axis and the value of the tuning parameter that minimizes the error is reported on the y axis. The two lines are the 25^{th} and the 75^{th} percentile of the corresponding distribution over 10 classes on a Log scale. The circles and triangles are the tuning parameter values that minimize, in each moment class, the arithmetic and the geometric standard deviation of the absolute and relative errors, respectively. The number of samples in each class are reported on the lower row."

The redundant description of Figure 3 has been removed p 17648, L11-13.

- References.

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