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Atmospheric Chemistry and Physics Discussions

ACPD

Interactive comment

Interactive comment on "On the distinctiveness of oceanic raindrop regimes" *by* David Ian Duncan et al.

Anonymous Referee #1

Received and published: 18 February 2019

This is certainly a useful paper which is suitable for publication in Atmospheric Chemistry and Physics. However, there are some points which the authors may wish to consider prior to final publication, as follows:

Specific to the last sentence in the Abstract: Please see Munchak, et al., 2012: "Relationships between the Raindrop Size Distribution and Properties of the Environment and Clouds Inferred from TRMM", J. Climate, 25, 2963–2978. This is a relevant paper.

General: Note that MGD is sometimes refers to G-G, see for example, Petty, G. W., and Huang, W. The modified gamma size distribution applied to inhomogeneous and non-spherical particles: Key relationships and conversions. J. Atmos. Sci. 2011: Vol. 68, pp. 1460–1473.

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Discussion paper

Page 2, line 5: Refer to Testud et al here.

Page 3, line 31: What is the size resolution of the ODM?

Page 4, line 4: Please clarify "impacts of turbulence"

Page 4, para 3: It's not clear why the accuracy should depend on oceanic or continental cases. Bumke and Seltman showed that the average DSD shapes were similar in coastal and continental locations. They used the scaling of Sempere-Torres et al to fit the coastal and continental DSDs and found an invariant shape. Perhaps this should also be mentioned here.

Page 7, end: Recommend plotting Nw vs Dm on semi-log scale to further illustrate the inverse correlation between the two, for ODM and GPM.

Page 9, line 5: It's not clear why mu=2 fits the mode of the normalized DSD shape in fig. 3 especially for D/Dm<0.5. In fact mu=-2 appears to be better.

Page 9, line 8: what method? Moments-based, MLE...

Page 9, line 15: Please clarify this range for mu for tropical cases. The mu estimate is very sensitive to the shape of the small drop end. It is not clear what the resolution and accuracy are for the ODM at tiny-small sizes. No independent evaluation of the ODM accuracy is given for the small drop end. Hence, caveats are recommended when statements regarding mu ranges are given.

Page 10, line 2: What is meant by "moments" in this context? Are you referring to the moment-based estimation of mu?

Page 11, line 6: use of "power" is not conventional...please use another descriptor.

Page 11, line 15: the moments fit should be explained earlier.

Page 11, line 15: Units for RWC are not clear....seems like mg/m^3. No discussion of fig.5 ? Except for second panel, the remaining GMM are not close to the measured

N(D).

Page 12, line 2: At this point, recommend that the 4-parameter gamma be used to illustrate that 2 shape parameters are needed.

Page 17, line 5: The conclusion is based on the assumption that the resolution and accuracy of N(D) from ODM for small drops is well-established but this has not been demonstrated. The use of total accumulation is not the only criteria by which one justifies the use of the MGD. The width of the mass spectrum is considerably increased when the small drop end is accurate. From cloud physics viewpoint the N(D) is a result of various microphysical processes that are controlled by the low order moments including M0. The GPM algorithms use path integrated attenuation as a constraint...the attenuation is also sensitive to the small drop end especially at Ka-band.

Page 17, line 29: What about stratiform vs convective vs shallow rain types?

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