

***Interactive comment on* “On the observation of unusual high concentration of small chain-like aggregate ice crystals and large ice water contents near the top of a deep convective cloud during the CIRCLE-2 experiment” by J.-F. Gayet et al.**

Anonymous Referee #1

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The paper reports on the observation of high concentration of chain-like aggregated ice crystals near the top of a deep convective cloud during the CIRCLE-2 experiment. The paper represents a stimulating contribution to the recent discussions on the abundance of small ice particles in cirrus clouds. The authors nicely combine their in-situ measurements of the cloud particle microphysics with different airborne and spaceborne remote sensing observations which makes the paper distinguished from other studies. The paper is well structured and the results are presented in a clear and con-

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cise way. I recommend to publish the paper in ACP after the following minor revisions have been made:

On page 23923 the authors state "It should be noted that the subsequent profile of the CALIOP depolarisation data (not shown here) does not reveal any indication of oriented pristine ice crystals and therefore cannot explain the high beta values observed in the overshooting cell and in the surrounding cirrus ...". It would be worth to present these depolarisation data since high depolarisation ratios are expected especially for small micrometer-sized ice crystals (see Mishchenko and Sassen 1998). In this way the high concentration of small ice particles, as measured by the in-situ methods, could be further evidenced by the observation of a high depolarisation ratio for this specific deep convection cloud. In this context it is worth to note that the global survey of CALIOP linear depolarisation ratios, published by Sassen and Zhu (2009), shows that high depolarisation ratios are found predominantly at low latitudes - a region where deep convection is most frequent.

Page 23932, line 9: insert 'decreasing' before 'RHi'

Mishchenko, M.I., and K. Sassen, 1998: Depolarization of lidar returns by small ice crystals: An application to contrails. *Geophys. Res. Lett.*, 25, 309-312, doi:10.1029/97GL03764.

Sassen, K., and J. Zhu (2009), A global survey of CALIPSO linear depolarization ratios in ice clouds: Initial findings, *J. Geophys. Res.*, 114, D00H07, doi:10.1029/2009JD012279.

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