

Interactive comment on “Measurements of electric charge separated during the formation of rime by the accretion of supercooled droplets” by R. A. Lighezzolo et al.

R. A. Lighezzolo et al.

avila@famaf.unc.edu.ar

Received and published: 25 November 2009

1. The reviewer correctly points out that the authors (Hallett and Saunders 1979) did not conclude “...that the magnitude of the charges on the fragments was too small to be able to account for the observed electrification rates in thunderstorms”. Actually it was suggested by Saunders 2008 (Space Sci Rev, 137: 335–353; see page 342). It will be corrected in the revised manuscript.

2. Certainly, it could be interesting to examine the role of this mechanism in thunderstorms having inverted-polarity structures. The problem is that the microphysical conditions and mechanisms leading to inverted polarity storms (IPS) are not fully un-

C7483

derstood at present. We do not know whether or not the experimental conditions simulated in the current experiments are relevant for IPS. Even if someone found evidence that the lower negative charge centre in IPS is comparable in magnitude to the lower positive charge centre in ordinary thunderstorms, it would not be possible to conclude that the splintering charging mechanism does not contribute significantly to charge separation in clouds. For example, if high liquid water content is a necessary condition for IPS, it is expected that the splintering charging mechanism will be not a very efficient mechanism of charge separation (we found that this mechanism has a low efficiency at high rime accretion rate). But we can not conclude that this mechanism will be not an efficient mechanism (in the lower part of the cloud) for moderate and low liquid water content. In summary, we think that there is not enough evidence available at present to support this discussion in the paper.

3. We do not understand what the reviewer means by “..it’s important to point this out in humility,..”.

In reference to the scope of the results, we stated:

“Although the values of the charges that soft hail pellets could acquire via this mechanism are relatively small, ...”

“The mechanism of ejection of charged particles could, in principle, explain the positive charge smaller than 5 pC acquired by individual precipitation particles of mm-size in the lower part of the cloud.”

Does it induce readers to confusion? We do not think so.

4. We can agree with the Reviewer that this reference (Avila et al 2003) can be irrelevant in that paragraph and will be removed from there.

However we do not agree with the Reviewer that the interpretation of the results in that work is “contentious and not supported yet by any other researcher”. The results of that work are absolutely true and well documented in the paper.

C7484

5. Ok, we will remove the term “non-inductive mechanism” in this paragraph.

It is important to clarify that the Relative Growth Rate (RGR) is not a theory but a mechanism which helps to identify what is the charging sign of the ice particles after collisions. The RGR is not the only mechanism proposed to explain the charge separation in ice-ice collisions (See Saunders 2008).

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 23349, 2009.

C7485