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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ice nucleation properties of volcanic ash from Eyjafjallajökull" *by* C. R. Hoyle et al.

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Unique results of state-of-the-art laboratory studies on the influence of Eyjafjalla volcanic ash particles on heterogeneous ice formation are presented.

I have a few recommendations:

The recent paper of Seifert et al. (JGR 2011, now available at the JGR webpage, paper in press) should be mentioned. Could be done already in the introduction. This paper deals with the influence of the Eyjafjallajökull volcanic ash on heterogenous ice formation in 'real world' tropospheric clouds. The study is based on lidar observations at Leipzig and Munich in April 2010. I recommend to discuss the observations and compare the findings with your laboratory studies.

One question: How can freezing temperatures of about -10C be explained by immersion freezing? According to the study of Fornea et al. (2009), temperatures of <-17C are required for immersion freezing to take place. Contact freezing may start at -8 to -10C. Please discuss!

Sections 4.1.1, 4.1.4, and 5: IN concentrations (INC) and the relationship to aerosol particle concentration (APC, coarse mode) are discussed. Seifert et al. (2011) also present results in this respect (INC, APC, APC/INC), and thus give numbers for INC at different heights after the Eyjafjalla eruptions in April 2010.

Sections 4.4, 4.5, and 5: The lidar observations in Seifert et al. (2011) indicate: there was ash everywhere in the troposphere up to the tropopause over central Europe during the first week after the strong eruptions in April 2010. Thus entrainment of dry ash particles (triggering contact freezing) into cloud layers was always possible. Thus, not only immersion and deposition freezing may have played a significant role. Cloud cover (mid and upper tropospheric clouds) was most probably increased due to the presence of ash according to the lidar observations. This is also mentioned by Seifert et al. (2011).

In conclusion, our experience (based on lidar observations during SAMUM 1, pure Saharan dust impact on cloud ice formation, Ansmann et al., JGR 2008, and now after the Eyjafjalla eruption) tells us that ash is at least as good as dust (if not better) regarding the initiation of ice nucleation. This is in agreement with the impression of Bingemer et al., ACPD 2011. Could be mentioned.

Disregarding my comments, a very good paper, a valuable contribution to atmospheric science.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 17201, 2011.