Geosci. Model Dev. Discuss., 3, C675–C676, 2011
www.geosci-model-dev-discuss.net/3/C675/2011/

**Geoscientific
Model Development
Discussions**

Interactive comment on "MADE-IN: a new aerosol microphysics submodel for global simulation of potential atmospheric ice nuclei" *by* V. Aquila et al.

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Received and published: 10 January 2011

We would like to thank D.J. Cziczo for this important comment.

We agree that many laboratory studies indicate that mineral dust aerosols are probably better ice nuclei (IN) than black carbon (BC) particles and that BC particles might be very poor IN under conditions of the lower and middle troposphere. We agree that these aspects need to be described in more detail in the manuscript and we will revise the text accordingly.

BC is considered as a potential IN in EMAC/MADE-IN since several laboratory studies on heterogeneous ice formation at low temperatures (cirrus regime) show that specific BC soot particles are able to act as IN under such conditions. DeMott et al. (GRL,

1999) showed that Degussa soot coated with multilayer sulphuric acid can nucleate ice at relative humidities below the homogeneous freezing threshold. Möhler et al. (JGR, 2005) showed that spark generated soot can form ice well below the homogeneous freezing threshold under cirrus conditions. (See also Kärcher et al, ACP, 2007, for a review of the results of these studies). Also the recent laboratory study by Koehler et al. (PCCP, 2009) shows that small fractions of different types of BC particles can act as IN at low temperatures.

Since we intend to use EMAC/MADE-IN particularly for studies of IN effects on cirrus clouds, we do not want to exclude BC from our argumentation in this manuscript. EMAC/MADE-IN was developed to simulate potential IN not only at lower altitudes but also at cirrus levels.

We would also like to admit that EMAC/MADE-IN just provides information about potential IN (number, composition and mixing state of dust and BC containing aerosols). It neither simulates the fraction of these potential IN which is actually able to form ice nor their specific ice formation characteristics, such as critical relative humidity thresholds. These parameters will have to be defined properly when MADE-IN is coupled to an ice nucleation scheme (e.g. Kärcher et al., JGR, 2006) within the global model framework. In this case, the fraction of the potential IN which could actually act as ice forming nuclei as well as other relevant parameters, such as the respective humidity thresholds, have to be defined accordingly. At that point, ice formation ability of dust can be favoured and less efficient (or even no) ice formation on BC can be assumed.

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Interactive comment on Geosci. Model Dev. Discuss., 3, 2221, 2010.