We would like to thank Prof. Ansmann for his comments and suggestions, which helped us to considerably improve the manuscript. Specific answers and manuscript modifications related to his comments are given below in bold.

General remark: The paper is well written, contains a lot of valuable information and is clearly worthwhile to be published. However, as a field experimentalist (and in addition meteorologist), I am not satisfied when a REVIEW only covers modeling and laboratory studies and efforts, and does not consider the literature dealing with field activities (heterogeneous ice formation in real clouds in their natural environment observed routinely and/or in field campaigns).
We apologize for having neglected field studies in our review. The aim of our paper is to highlight the limitations on the current available laboratory studies and instrumentation. We changed the title to properly reflect that now. There are too many gaps in the laboratory studies that must be addressed by the scientific community in order to understand the atmospheric relevance of contact freezing. Thus we entirely focus on laboratory studies.

So, there are two possibilities: include the field activities, or change the title to make sure that this REVIEW only covers laboratory studies and modeling.
Based on your suggestion and the other reviewers, the title of the manuscript was changed to be clear that it focuses on laboratory studies ("Contact freezing: a review of experimental studies").

What do I mean when I say: field studies? Then I want to say that besides aerosol cloud interaction there are further meteorological aspects (besides temperature and relative humidity), namely dynamical effects: organized updraft and downdraft motions, wind shear, turbulence, entrainment etc.
We agree that those parameters are very important for the understanding of contact freezing. Luckily in the laboratory they do not play a role and therefore starting with laboratory studies of contact freezing seems to be a good start.

Or more precise: Heterogeneous ice formation (e.g., contact freezing) not only depends on aerosol type, temperature, and moisture. Vertical motions are required to trigger cloud formation and many processes that increase the lifetime of the cloud or terminate the life cycle. Entrainment of dry air (and thus dry particles) into the cloud (from the side, from above) is needed to get a significant effect caused by contact freezing.
See answer above.

So what I wanted to see is also a review of the literature dealing with field experiments. There are not so many papers, I believe, may be Hobbs et al. (in the 1980ies, stating that contact freezing is favorable for cumulus cloud glaciation, starting in turrels in cloud tops), Levin et al. (several journals, in the 1990ies and early 2000s), Ansmann et al. (JGR, 2005), Heymsfield papers (I am not sure: : :) , special issue on ICE-D (JAS 2010 special issue?), Seifert et al., (JGR 2011, volcanic impact). And, Korolev et al (JAS, 2003, 2007, 2008), focusing on the impact of updrafts and downdrafts on cloud glaciation (modeling paper!).
We added few more references in the introduction to further discuss the atmospheric relevance of contact freezing. However, we do not discuss in detail the field results that you suggested since this is not the focus of this review.

The topic of the review should be: At which natural aerosol-cloud-dynamics conditions the situation is obviously favorable for contact freezing. Otherwise the question remains: Ok,

contact freezing may be important (as laboratory and modeling work suggest), but is it really of importance????
Once the laboratory experiments are quantitative and we are able to control RH, droplet size, particle size and temperature, we will be able to incorporate dynamical parameters (e.g., turbulence). However we are still far away from doing this yet. This will tell us if contact freezing is atmospherically relevant or not. This can also be supported by field studies where contact freezing instrumentation such as the NCAR ice nucleus counter, the CSU-CIC, the CLINCH, the wind tunnel or the EDB are used.

Some examples: We (Ansmann et al, JGR 2005) showed a case, where layered water clouds in Saharan dust began to glaciate at cloud base and top, this points to contact freezing, when large dry dust particles come close to drops. Seifert et al. (2011) suggest that boundary layer water clouds start to glaciate via contact freezing when they penetrate into the free troposphere with large IN concentration which was the case after the Eyjafjallajokull volcanic event over central Europe in April 2010. The favorable dry IN get entrained and trigger contact freezing. What other scenarios provide favorable contact freezing conditions?..... That should be summarized somehow in such a REVIEW (the field experiment part of the REVIEW).
As stated above, the aim of our paper is to review the laboratory experiments to highlight the needs on this field.

I should state (again) that I like the paper and do not want to criticize it too much, the aim is just increase the sensitivity of the authors towards the real world (outside the labs and models…).
This is now mentioned in the outlook of the revised manuscript.

Some details:
Page 7814, line 12:… conditions relevant for the different heterogeneous modes of ice Formation… to my opinion RELEVANT must include statements concerning dynamics, not only aerosol, temperature, water vapor…
Dynamics do not affect nucleation rates directly; they however influence parameters such as RH and T and possibly others locally which then influence nucleation rates. So the knowledge of RH and T should be sufficient to describe nucleation processes on a local scale. We think that to study how dynamics interact with microphysics is a completely different topic.

Page 7815, line 12:..to explain observations… which observations do you mean?
Certainly not the 'real ones… in the atmosphere, in the natural cloud environment….'
The word "laboratory" was added to make clear that we refer to laboratory observations only.

Page 7815, line 19:... If the laboratory observations are representative for atmospheric conditions:…. How can they be representative without any potential of labs to study of the impact of air motion?
The sentence has been revised to: "If the laboratory observations about the onset temperatures of contact nucleation are representative for atmospheric conditions"

Page 7815, line 28: Hoose et al (2010) developed :… with the aim to investigate the importance of this freezing mode:…. Did these authors include cloud dynamics and entrainment studies? How can one model global effects of heterogeneous ice formation without a clear understanding of cloud life cycles and the link to het. ice formation?
How can one then say anything about the importance of a given effect?

Some cloud dynamics are included in global models, such that a subgrid-scale component of the vertical velocity is considered for cloud formation and entrainment is included in convective clouds. Of course, the small-scale dynamics are still missing but will be included over time.

Page 7816, line 9-11:… we summarize the available :… but we leave out the field experiments: :…. (would be my comment)
This sentence was modified taking into account your suggestion.

Page 7816, line 16 up to the end: These key questions do not cover dynamics aspects.
This is out of the scope of our paper, but we mention this limitation of the laboratory studies in the outlook.