

Interactive comment on “Atmospheric ice nucleators active ≥ -12 °C may be quantified on PM₁₀ filters” by F. Conen et al.

F. Conen et al.

franz.conen@unibas.ch

Received and published: 23 December 2011

Thank you for the numerous suggestions regarding correctness, clarity and style. They are all very helpful to improve the manuscript. Some of the specific comments and questions also call for a more detailed reply.

2. Approach, material, and methods

Page 6848, lines 24-27: This is correct. We limited our temperature range of interest to where biological particles are likely to be the dominant form of IN. By chance, it turned out that this is also the temperature range to which the method is limited.

When developing the method, we tested whether sonication (24 W/liter for 10 min) of
C2423

the filter bits immersed in water in their test tubes would increase the number of IN detected. It did not. So, either sonication did not release the IN from their entrapment, or the entrapment had not affected IN activity before sonication. Under the microscope, the filter looks like a leafless hedge (quartz fibers) into which wind has blown debris of all size and shapes (particles). Contact between quartz fibers and particles is limited to a small part of the total surface of a particle. From this, we would not expect substantial artifacts due to the particles being embedded in the quartz fiber structure.

Page 6849, last sentence: While the start altitude might be somewhat uncertain, previous test of the model showed that the best model results in terms of CO simulations (evaluated performance parameters were correlation and root mean square error) were obtained with a start altitude at 3000 m a.s.l. and not at station altitude. This is discussed in more detail in the references given in the current manuscript. Additional support for the starting altitude used here stems from comparisons of water vapour mixing ratios at the site and in the free troposphere over Payerne 85 km north-west of JFJ on the Swiss Plateau. Again these agree best for an altitude of 3000 m a.s.l. over Payerne.

3. Results and discussion

Page 6850, last sentence: We are sorry to hear that this comment comes across like an indictment. This was not at all what we had in mind. Reading it again, we have to admit that its phrasing is a bit unfortunate. You are certainly correct in that the shorter the time scale the larger the variability. Even on the same time scale, real variability is unlikely to be the same at different locations and times of the year. Reconsidered, the statistical issue may indeed be minor.

Page 6851, lines 6-7: Yes, the origin extends into Northern Africa. However, the important difference between the first and the third episode is that the extent of the first episode over Northern Africa is limited to the coastal areas, while in the third case central Saharan regions that are potential dust source areas contributed as well.

Page 6851, line 21: In the free troposphere CO shows a strong latitudinal gradient with lower values towards the south. Therefore, decreased CO at JFJ often points to southerly free tropospheric advection, as is confirmed by the foot-prints. It is stated that during the second half of the period the sampled air had increasingly more contact with regional emissions (for example in Northern Italy), leading to largely increased CO mixing ratios. We carefully adjusted the paragraph to highlight the difference between free tropospheric transport and regional scale influence.

Page 6852, line 20-21: Fragments of pollen may well end up in the atmosphere, but these are IN active at temperatures well below -12 oC (please see recent paper by Pummer et al. and its discussion in Atmos. Chem. Phys. Discuss., 11, 27219-27241, doi:10.5194/acpd-11-27219-2011, 2011).

Page 6853, Caveats: Thank you for the clarifications.

4. Conclusions

Thank you for this very useful suggestion.

Editorial comments Abstract, line 1: Aren't "ice nuclei", strictly speaking, particles that were found in the centre of ice crystals collected from the atmosphere? Here, we studied particles that may have also been deposited dry or in liquid droplets onto the filter. In our assays they showed ice nucleation ability. Hence, they were "portential ice nuclei", or particles that nucleate or, more briefly, "ice nucleators", but not necessarily "ice nuclei".

Page 6851, line 22: Correct, it should be July (also in line 23).

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6845, 2011.