

***Interactive comment on* “Conceptual study on nucleation burst evolution in the convective boundary layer – Part I: Modelling approach” by O. Hellmuth**

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Response to referee 1 (anonymous)

1. General remarks to referees 1-3

The referees took the time to scrutinise the comprehensibility and details of the paper and to recommend revisions in essential parts. This deserves special thanks. It is so much better as the whole set of four papers is "a rather huge task for a referee". I ask for understanding of having simultaneously submitted four parts of the paper. My intention was to ensure the traceability of the proposed approach as far as possible.

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The present paper reports on a work in progress. Considering the actual stage of development, the present title runs the risk to insinuate the return of final results on a very tricky subject of an ongoing and controversial debate. The main intention is to demonstrate the feasibility of a high-order columnar modelling approach, and to discuss some relevant characteristics in view of previous observations. To express the preliminary character of the present approach and of the obtained results more appropriately, the title is wished to be changed as follows: "Columnar modelling of nucleation burst evolution in the convective boundary layer - First results from a feasibility study. Part I: Modelling approach. Part II: Meteorological characterisation. Part III: Preliminary results on the physico-chemical model performance using two 'clean-air mass' test scenarios. Part IV: Valuation of the simulation results in view of previous observations."

2. Response (AC) to specific comments of RC1

2.1 RC1: Page 11415; Addition of QUEST reference.

AC: Added. Thanks. The reference to QUEST special issue is inserted at page 11415, between line 27 and 28: "A comprehensive compilation of previous and current results of the QUEST project can be found in an ACP Special Issue edited by Haameri et al. (2004)(http://www.copernicus.org/EGU/acp/acp/special_issue9.html)."

2.2 RC1: Page 11418, section 2; Description of the situation in boreal forest, reference to Hyvoenen et al. (2005).

AC: Added. Thanks. See response to the other referees of part I and part IV. Some interpretations and conclusions in part IV with respect to boreal forests will be revised and/ or formulated more cautiously. With respect to NPF in boreal forests we are obviously in a situation, that observations can, perhaps, be well reproduced for the "wrong reason". For example, the effects of omitting processes (clouds, rain, organic %chemistry) can be overcompensated by the model setup, e.g., by the choice of the initial and boundary conditions. It has become clear, that the situation in boreal forests

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is much more complicated than reflected in the present scenarios. There are different and competing ways to form new particles.

With respect to part I, the reference is added on page 11419, line 3 just after "... approximately 33% of all days." as follows:

"Recently, Hyvoenen et al. (2005) (see references therein) reported on an occurrence of NPF events in boreal forest environments of around 50-100 times a year, correspondingly 14-27 %. A detailed evaluation will be given in a forthcoming paper."

The paper of Hyvoenen et al.(2005) deserves to be more specifically evaluated with respect to the interpretation of the present results. In response to RC1, I decided to discuss that paper in a technical note to be submitted to ACPD. See also my responses to the referees of part IV.

2.3 RC1: Pages 14124-25: Revision of the part describing the laboratory experiments performed by Berndt et al. (2005).

AC: This part has been completely rewritten. Thanks.

2.4 RC1: Recommendation to additionally describe numerical tests carried out.

AC: Added. Such tests were performed. A complete new section was written on this subject: 4 Numerical realisation and basic tests. 4.1 Amplitude error. 4.2 Transport error. 4.3 Phase error and nonlinear stability. 4.4 Mass conservation. 4.5 Sensitivity against changes in the turbulence parameterisation

2.5 RC1: Scrolling all equations through for typos.

AC: Performed. Several times ...

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 11413, 2005.

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