

Interactive comment on “Observation of new particle formation and measurement of sulfuric acid, ammonia, amines and highly oxidized molecules using nitrate CI-API-TOF at a rural site in central Germany” by Andreas Kürten et al.

Anonymous Referee #1

Received and published: 22 September 2016

Measurements of sulphuric acid, amines, ammonia and VOC oxidation products are reported in connection with observations of atmospheric new particle formation (NPF) at a rural site in Germany. Focus of the manuscript is on showing that the nitrate CI-API-TOF instrument is capable of measuring in ambient conditions ammonia, amines and oxidation products of organic compounds. These have been identified in recent laboratory studies to enhance sulphuric acid–water nucleation rates to atmospheric levels, therefore detecting them in atmospheric measurements is highly relevant for the current nucleation research. The measurements of sulphuric acid are further evaluated by comparing to steady-state proxy concentration. Reporting the proxy coefficients for this

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environment provides valuable information, since ambient measurements of sulphuric acid are rare, and the proxies have been widely used in different environments.

The CI-API-TOF data is used to make comparisons between days with and without occurrence of NPF, in order to find out which precursor species affect NPF at this site. No definite participation of ammonia, amines or HOMs to nucleation at this site could be made, but the possible reasons for this are adequately discussed in the manuscript. Also comparisons to chamber measurements from the CLOUD experiment are made.

The manuscript is well suited for publication in Atmos. Chem. Phys. I have listed some minor comments and correction/clarification suggestions below (in addition to those made by the anonymous referee 2).

Minor and technical comments:

Line 35: “. . . a larger fraction . . .” should be “. . . a large fraction . . .”

Line 78: Please add the abbreviation HOM here, as it is used later in the text.

Lines 208–210: What are the detection limits for the SO₂, O₃ and NO_x monitors? In section 3.2, the lowest SO₂ concentrations of 0.05 ppb sound quite low for a standard SO₂ monitor.

Line 202: Does this mean the reaction rate constants for the proton transfer reaction in the PTR-MS are similar for different monoterpenes, and therefore are detected with similar efficiency as alpha-pinene?

Lines 242–244: Please check whether it was 6 or 7 NPF days during the campaign. In Section 3.9 (line 590) it is said 7 events and also Fig 9 shows seven J values.

Line 600: Why is the condensational growth out from the 2.5–10 nm size range not considered in Equation 7? That is an additional loss term for particles in this size range, so the right hand side of Eq 7 should have an additional term $GR/(7.5 \text{ nm})^N$ (see Kulmala et al. (Nature Protocols 7, 1651–1667, 2012), Equation 9).

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Caption text of Figure 1: Please add a mention that the arrows in the bottom panel indicate NPF days. Also check whether there should be six or seven days marked as NPF days (Fig 9 shows J rates for seven days).

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-294, 2016.