

Response to Referee number 2

25th January 2021

The authors would like to thank Referee no. 2 very much for her/his expert and valuable comments to further improve and clarify the MS. We have considered all recommendations and made the appropriate alterations. Our specific responses to the comments are as follows, while the textual modifications amended can be followed in the marked-up version of the MS, which is available on the website.

1. To our best knowledge, the fundamental relationship between NPF and vegetation activities should be via biogenic VOCs, which can influence the HOM formation, as well as oxidation capability. Therefore, I may suggest the authors can add more discussions on biogenic VOCs, especially monoterpene.

A separate paragraph discussing the role and main effects of biogenic VOCs (mainly monoterpenes) in NPF events in more detail was added to sect. 2.1.1 as requested. We also included several new primary references on these issues. As far as the dynamic properties (e.g. GR) are concerned, they were primarily discussed in a previous article (Salma and Németh, 2019) cited in the MS.

2. Vegetation activities may also have related to the growth rates (GR) of NPF besides fNPF. It would be good if the authors can add some discussions on the relationship between GR and vegetation activities.

See the response to Comment 1.

3. Sulfuric acid is the most critical parameter influencing NPF. However, it was simulated but not measured in this study. Did the authors have some measurement data to verify the proxy to calculate sulfuric acid?

The sulfuric acid concentration was measured on-site directly by chemical ionization atmospheric-pressure interface time-of-flight mass spectrometry in March-April 2018, and these experimental results were utilised to derive dedicated fitting parameters for central Budapest for calculating gas-phase H₂SO₄ concentration as presented by Dada et al. (Atmos. Chem. Phys., 20, 11747–11766, 2020), which also involves the dimer formation. The concentrations were determined in a retrospective manner for all earlier years and time intervals and were also compared to the proxy values used in our earlier studies, namely to the proxy of Petäjä et al.

(Atmos. Chem. Phys., 9, 7435–7448, 2009). A more rigorous evaluation has been just finished and is to be part of a future MS, while its main finding related to the present work was amended to the MS.

4. Can f_{NPF} be predicted using simulated sulfuric acid and CS?

Based on the literature sources cited and discussed in the MS, the prediction of f_{NPF} seems to be a rather complex issue and, therefore, it was not covered in the present MS.

5. Line 53: omit “extremely low volatility organic compounds (ELVOCs) or”

The expression was removed.

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