Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-434-AC1, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Arabitol, mannitol and glucose as tracers of primary biogenic organic aerosol: influence of environmental factors on ambient air concentrations and spatial distribution over France" *by* A. Samaké et al.

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Received and published: 16 July 2019

ACP-2019-434 Answer to Anonymous Referee #1 comments:

This manuscript provides detailed insights into the biogenic primary organic aerosol emission sources of the primary sugar compounds (SC), i.e., glucose, arabitol and mannitol. The study has been carefully designed and the results have been interpreted in detail. The study covers 16 nation-wide sites all over France and contains a very comprehensive data set. It is clearly shown that the main drivers of SC atmospheric

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concentrations are ambient air temperature, relative humidity and vegetation density.

We thank the reviewer for his/her review. We have studied the comments and we have made revisions point by point. The detailed responses to the comments are given below, point by point, in blue color, including changes directly made to the manuscript, in red color.

Specific comments:

1. Introduction: glucose is recognized as a tracer for plant pollen but also for biomass burning. I miss some discussion about this issue in the introduction.

The reviewer is right that glucose can also originate from the thermal degradation of the plant materials (e.g., cellulose, a polymer of glucose). However, as evidenced in Figure R1.1, the concentrations of levoglucosan (a well-established tracer of biomass burning source) and those of glucose clearly display very different annual atmospheric evolution cycles: higher concentrations of levoglucosan in France are observed in the coldest season (winter) due to the increased biomass burning while those of glucose are observed in in warm seasons and coinciding with negligible ambient concentrations of levoglucosan. Such different temporal patterns indicate that the biomass burning is not an important source of atmospheric glucose.

Glucose can have a broad primary biogenic sources, e.g. from terrestrial plant pollen, fruits, and detritus, or from the degradation of the soil microorganisms (Xiao et al., 2018; Zhu et al., 2015) or even possibly from bubble bursting processes in remote oceans (Fu et al., 2013; Gao et al., 2011; Leck and Bigg, 2005). For these reasons, we have removed the term “specific” in lines 54-59.

2. In several parts of the text, figures and tables, mention is made of "glucose" but in fact "free cellulose" is meant. In order to avoid confusion, I suggest to make this more clear and replace "glucose" by "free cellulose".

In fact, both glucose and free cellulose are measured and analyzed separately in the

present work. We used glucose when the monosaccharide “glucose” is meant and free cellulose we considered the cellulose ambient cellulose.

Technical corrections: References: should be ordered chronologically. The references are now ordered chronologically, as suggested by the reviewer.

References Fu, P. Q., Kawamura, K., Chen, J., Charrière, B., and Sempéré, R.: Organic molecular composition of marine aerosols over the Arctic Ocean in summer: contributions of primary emission and secondary aerosol formation, Biogeosciences, 10(2), 653–667, doi:10.5194/bg-10-653-2013, 2013. Gao, Q., Nilsson, U., Ilag, L. L., and Leck, C.: Monosaccharide compositional analysis of marine polysaccharides by hydrophilic interaction liquid chromatography-tandem mass spectrometry, Anal. Bioanal. Chem., 399(7), 2517–2529, doi:10.1007/s00216-010-4638-z, 2011. Leck, C. and Bigg, E. K.: Biogenic particles in the surface microlayer and overlaying atmosphere in the central Arctic Ocean during summer, Tellus B, 57(4), 305–316, doi:10.1111/j.1600-0889.2005.00148.x, 2005. Xiao, M., Wang, Q., Qin, X., Yu, G., and Deng, C.: Composition, Sources, and Distribution of PM2.5 Saccharides in a Coastal Urban Site of China, Atmosphere, 9(7), 274, doi:10.3390/atmos9070274, 2018. Zhu, C., Kawamura, K., and Kunwar, B.: Organic tracers of primary biological aerosol particles at subtropical Okinawa Island in the western North Pacific Rim: Organic biomarkers in the north pacific, J. Geophys. Res. Atmospheres, 120(11), 5504–5523, 2015.

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2019-434/acp-2019-434-AC1-supplement.pdf

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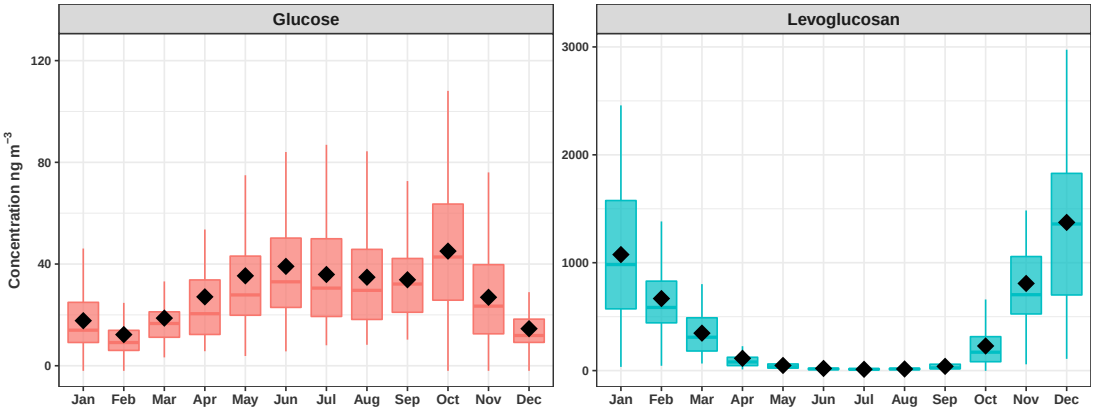

Fig. 1. Annual evolution cycles of the glucose (left) and levoglucosan (right) concentrations in PM10 measured at the urban site of Grenoble Les Frênes, from the years 2012 to 2018 (details in supplement)

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