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Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-318

Anonymous Referee #2

Referee comment on "Residence times of air in a mature forest: observational evidence from a free-air CO_2 enrichment experiment" by Edward J. Bannister et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-318-RC2, 2022

Review of the manuscript “Air parcel residence time in a mature forest: observational evidence from a free-air CO2 enrichment experiment”

General comments

This study analyses an extensive dataset from a FACE facility in the UK with the objective to quantify the air parcel residence time a mature broadleaf deciduous forest ecosystem. The manuscript is generally very well written and clearly structured. All figures are well designed and very instructive. The introduction covers the relevant literature well, identifying the knowledge gaps, clearly state the objective. The methods section is a pleasure to read and provides all relevant details on the site, the study period, the instrumentation and the data processing. The presentation of the results is informative and addresses the objectives defined by the authors. This section is accompanied by a critical discussion of the results with important notes on further analysis using LES or physical models. The conclusions are meaningful and drawn correctly. Overall, this is an excellent manuscript and it was a pleasure to read it. I just have one suggestion: conclusion 2 could be substantiated by calculating the Damköhler number, which relates the chemical reaction timescale to the transport timescale, as in, e.g. Karl et al. (2013). Therefore, I recommend this article for publication after minor revisions.

Karl, T., Misztal, P. K., Jonsson, H. H., Shertz, S., Goldstein, A. H., & Guenther, A. B. (2013). Airborne flux measurements of BVOCs above Californian oak forests: experimental investigation of surface and entrainment fluxes, OH densities, and Damköhler numbers. Journal of the Atmospheric Sciences, 70(10), 3277–3287. https://doi.org/10.1175/jas-d-13-054.1