

Interactive comment on “Quantification of chemical and physical processes influencing ozone during long-range transport using a trajectory ensemble” by M. Cain et al.

Anonymous Referee #1

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This paper presents a novel Lagrangian photochemical modeling technique to study the effects of mixing and chemistry on the chemical evolution of pollution plumes transported across the North Atlantic. I find the methodology to be sound, well described and the authors do a good job of highlighting the processes that the model handles well and those that aren't handled as well. Other than a few stylistic modifications, as described below, I recommend that this paper be published in ACP.

If no explanation is given for a comment below, please insert the suggested text into the appropriate place in the manuscript.

Page 3020 line 11 The work “acting” is not necessary

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Page 3021 line 4 Delete “contributing”

Page 3021 line 7 “production of O₃ within or immediately downwind”

Page 3023 line 2 “and transformation of polluted air masses across the North Atlantic Ocean took place”

Page 3024 line 15 The correct name for the NOAA aircraft is the WP-3D

Page 3025 line 19 “will give rise to different and possibly erroneous chemistry”

Page 3025 line 2 Was the ozone overestimated because NO_x was diluted and therefore became more efficient at producing ozone?

Page 3027 line 22 Isopreme should be Isoprene

Page 3031 line 14 When you say the composition is constant below the lowest latitude data point, are you just extrapolating the chemical measurements all the way down to the surface?

Page 3035 line 17 You say that there are no emissions over the ocean, but what about ship emissions? According to the work by J. Corbett, U. of Delaware, ship emissions account for 10-15% of global anthropogenic NO_x emissions. What effect does the neglect of ship emissions have on your results?

Page 3052 line 9 “This is not because”

Page 3056 line 1 This sentence is not constructed properly and needs to be rewritten.

Page 3056 Ideally, couldn't you improve the chemical composition of the shadow trajectories by referencing the shadow trajectories with the off-line output of a Eulerian chemical transport model? This could be a way to have the best of both worlds, the detailed chemistry and mixing of a Lagrangian model and Eulerian estimates of species for all locations and all times.

Figures 1-5, and 9 It would be much easier on the reader if you can replace the Julian

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days on the x-axis with the corresponding days of July.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 3019, 2012.

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