We thank the editor for the comments on the manuscript. We have updated the manuscript accordingly (changed made in bold text) and have addressed the comments below).

"Please amend section 2.3 to make it absolutely clear how equation (1) is implemented in the model and to clarify the relationship between equations (1) and (2)."

We have clarified the equation for physical effective age in section 2.3. We have expanded equation 1 to be clearer about how the calculations are implemented in our analysis and how we calculate the age at a given vector position and time.

"In equation 1, I presume the sum is over the number of tracers in a model run. So, for a run 30 days long, i = 30."

The sum is from 1 to day *i* – therefore a run of 30 days long would the sum of from 1 to 30. We have made this clearer in the text with an example and amended the equation to to show this more clearly.

"I presume that A_i is a real number calculated at every model time step (i.e., not an integer as could be inferred from the current text)."

A_i is an integer – it is the tracer number. For example when summing the tracer 1 to 30, A_i would be a number between one and thirty. This has been made clearer in the text and equation.

"I presume that L_{m,i} is the value of the tracer, i, at a point, and that the chemical loss is multiplied in afterwards (online or offline) using L_{C,i} = L_{0,C,i}exp(-A_i/tau_i), where L_{0,C,i} is some (arbitrary) initial value and tau_i is the photochemical lifetime defined in the paper as 60 days."

We have now explained that *L_{m,i}* is the value of the tracer at given vector position and time. This factor takes in to account the atmospheric mixing. We have also shown that *L_{C,i}* is the chemical loss of the tracer at a certain time since emissions (t) by including the equation *L_{C,i} (t)= exp^(-t/tau).* Where *tau* is the lifetime (60 days).

"Tau_i presumably is given by 1/{<k.OH>}, where <k.OH> is the characteristic rate quasi-first-order loss rate for CO by reaction with OH. There is, therefore, a clear link between equations 1 and 2 relating to how <k.OH> is estimated by both approaches, and what assumptions allow <OH> to be separated from <k> in equation 2."

In all equations, both OH and *k* are assumed constant. We have now stated that these common assumptions allow us to directly compare the results from both methods and to determine the extent of the photochemical retardation.

"The constant value of <OH> implied by the use of a constant CO lifetime must also imply a constant value for <k> but this is not reported. Being clear about these values is important because of the relationship between equations (1) and (2)."

We have now included that our rate constant for both our physical age and our photochemical age are constant.

"The left-hand equality of Equation (2) defines t_a.<OH> as a concentration-time; the photochemical age is t_a only. This is not clear from the current text. <OH> is the time-and-space averaged OH concentration necessary to produce the observed linear correlation between the chemical tracers, and has been separated from the co-varying rate coefficient, <k>, somehow."

We have updated equation 2 (and 3) so it now shows the left hand equality as photochemical age and shows that the assumed OH value and assumed *k* values have not been separated.

“<k> is not OH-weighted so far as I can see. It is the space-and-time rate coefficient corresponding to the air parcel histories that determine <OH> and the tracer correlation, where the space-and-time averaging takes into account the temperature (and pressure, if relevant) dependence of the rate coefficient. If your L_{C,i} where space-and-time varying, it would give you a way of looking at <k> but the manuscript as it stands uses two slightly different implicit constant values in (1) and (2), which probably makes understanding the differences between A_i and photochemical age difficult.”

We have made the text and equation clearer to show how *k* is related to OH. We have expanded on our assumptions about pressure and temperature (both constant for these calculations). We have explained that both methods of ageing use common assumptions and therefore comparisons between the two can be made.

“The manuscript seems to suggest that the photochemical age approach is highly uncertain because it can vary a lot with the choice of <OH>. This underplays the strength of tracer-tracer correlations, which contain all the real atmospheric processes in all their complexity. T_a.<OH> is very tightly constrained by the measured tracers; perhaps the model should be attempting to compare with this metric rather than t_a.”

The manuscript does suggest that photochemical age can be highly uncertain with the choice of OH. We also state that our new physical age caluclations are not as senseitive to OH therefore we can gain an understanding on the extent at which a plume has undergone photochemical retardation. We have now shown, with our updated photochemical equations, that *t_a* is constrained by the tracers (as OH has now been explicitly included in the equations).