

Interactive comment on “Deriving stratospheric age of air spectra using chemically active trace gases” by Marius Hauck et al.

Anonymous Referee #3

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This paper uses a chemical transport model to simulate a variety of pulsed release and variable lifetime idealized trace gases to explore the seasonality of stratospheric age spectra in the model and compared to calculated age spectra based on the variable lifetime tracers that includes parameterized seasonal variability. The calculated age spectra are found by inversion from the simulated distributions of 40 trace gases with lifetimes from one to 118 months. The comparison between the pulsed tracer age spectra and the inversion-based age spectra is found to be good in most places, which seems to validate the general age spectra inversion method.

As I was reading the paper I kept waiting for the payoff of the detailed derivation and comparison of the inversion-based age spectra with the model pulse spectra. In my mind, that payoff would be an indication of the usefulness of this technique when it

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comes to real stratospheric trace gas measurements. But only in the last few sentences of the Summary section is the application of the inverse age spectra method on observational data mentioned, and then only to say that it would be 'challenging'. If it actually takes measurements of 40 trace gases with lifetimes from 1 to 118 months then the application of this method would not be possible. Another potential payoff could be an improved understanding of the model transport characteristics but that seems well captured by the pulse age spectra.

It seems that more work needs to be done to help readers and the community understand the benefits and possible uses of this technique. As the paper currently stands this is not clear and although the analysis is well done it does not do enough to advance our understanding of the field in a meaningful way. The paper also has many grammatical errors, too many to list here, so it needs a more careful proofreading.

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