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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Persistence and photochemical decay of springtime total ozone anomalies in the Canadian Middle Atmosphere Model" *by* S. Tegtmeier and T. G. Shepherd

Anonymous Referee #2

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This paper follows up on the work of Fioletov and Sheppard that examined the persistence and decay of ozone anomalies in the stratosphere. Their model (CMAM) obtained a result that agreed pretty well with data despite having some known deficiencies in the model's simulation of the mean seasonal cycle. Tegtmeier and Sheppard assert that this provides a diagnostic test of transport and chemistry within the model.

I like the idea of following the decay of anomalies. I do have a number of comments on this paper that the authors should consider.

1. Page 3407, lines 1-7: The EESC fit is used to remove long-term chlorine variation. Was consideration also given to the seasonal dependence of the chlorine component

of the trend? Would it make any difference to the anomalies to include or not include a seasonal term in the removal of EESC dependence?

Page 3407, line 16: I don't like qualitative terms like "good agreement". In some ways it is good, in others not so good. What I see in figure 2 is greater variability in the data (this may be QBO related). What I also see is some memory from year to year in the model. The positive anomaly seems to appear consistently in years 13-18.

Page 3409, lines 1-7: I didn't understand the statements that in CMAM the midlatitude anomalies decayed rapidly after breakdown because of the larger impact of polar processes. From where am I supposed to deduce that? This was followed by reference to figure 7 where the regression agreed well with data. I was confused by the logic between these two seemingly conflicting statements.

Page 3409, lines 13-16: This concluding statement argues that the regression curve agreeing with data provides a "robust process-oriented diagnostic" of the model. I have to question this because of the following reasons:

1) The model passes this test of transport and chemistry (the authors' words), but fails on obtaining the correct seasonal cycle which is also a test of transport and chemistry (my words). Could this mean that the anomaly decay is not a robust test, or is only a weak test?

2) In the southern hemisphere, the model passes the test with and without heterogeneous chemistry (perhaps better without). I thus seems that removing a very important piece of the chemistry does not cause the model to fail the test. One could again conclude that the test is not robust.

I think that the above statements regarding the final concluding sentence in the paper is crucial to its acceptance. I conclude from reading the paper that the test may be only a weak diagnostic, or that it might be part of a small set of diagnostics that must be simultaneously passed to demonstrate the realism of the model's transport and

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