This is a very timely paper, as I think the role of ENSO diversity with respect to stratospheric dynamics (and hence transport) is a underappreciated and understudied topic. Overall I find the paper to be well-written paper with several very nice results. Most of comments are not criticisms, rather I have a series of comments that I think the authors may want to consider in terms of their interpretation of the results. The most important comment is in regards to the potential importance of PNA-like ozone teleconnections, which I think are probably quite important. To be clear, my comments are largely based on results from an ACP paper that I am the first author on, which is currently under review (see here: https://acp.copernicus.org/preprints/acp-2022-276/). Because this work is not yet published, I concede that the authors should not feel compelled to consider my suggestions. That said, I hope they can address at least some of the issues I raise, as I think doing so will provide readers with additional important details on the dynamics underlying ENSO-related stratospheric transport. That said, to conduct the additional analysis I suggest, the authors will need to have saved monthly mean ozone data on various pressure surfaces (geopotential height would be great too, but not required).

Also, I included some particularly relevant references at the bottom of the review that the authors probably want to glance through and then cite in the final version of their paper.

Best regards,
John Albers

Major comments:

Your EP-ENSO WACCM experiments are fairly similar to those we ran in the ACP paper I cited above and latitude-height cross sections seem to suggest that the stratosphere is responding similarly, at least qualitatively. For example, your Fig. 1g is more or less consistent with our Fig. 1c and 1e. There are some differences, but I am guessing that this largely represents differences in how the seasonal cycle of SSTs is prescribed in each of our respective experiments rather than actual differences in the dynamics (after all, both experiments use similar version of WACCM, so the transport dynamics should be equivalent).

Before I did into my main question about your results, I would like to make clear that I don't disagree with the part of your analysis where you diagnose the role of isentropic mixing and residual circulation advective transport. Rather, my comments below should simply be interpreted as suggestions for making your analysis and the interpretation of your results more complete. Keep in mind as you read what I write below, that I don't have a clear idea in my head for how to interpret the role of transport associated with 'ozone teleconnections' (explained below). That is, since the sum total of ozone transport should in principle be accounted for in your ozone budget equation (your Eq. 1), that would mean that the 'ozone teleconnection' related transport outlined below would (I think?) should be be accounted for by the residual advective transport terms (i.e., terms 1 and 2 on the RHS of your Eq. 1). However, I think that the residual transport terms are typically interpreted as occurring due to the induced meridional overturning (residual) circulation that is caused by wave driving. Yet in what I outline below, the ozone teleconnection-related transport does not neatly fit into that paradigm. Indeed most review papers on stratospheric transport specifically discuss mid-stratospheric extratropical isentropic mixing and advective transport in terms of planetary scale waves #1 and 2 (e.g., Fig. 2 of Plumb 2002, https://www.jstage.jst.go.jp/article/jmsj/80/4B/80_4B_793/_article). However, in what I discuss below, the transport appears to be associated with waves with wavenumber >2, which are thus largely evanescent.

So what do I mean when I refer to an 'ozone teleconnection'? When I first looked at our own results, I assumed, as you have here, that interpreting the ENSO-forced stratospheric transport could be accomplished by diagnosing the residual circulation and eddy flux transports (i.e., your Eq. 1). However, as I started looking more closely at the ozone anomalies month-by-month on individual pressure surfaces (latitude x longitude plots), it became apparent that ENSO was forcing, largely barotropic, PNA-like ozone anomalies that extended fairly deep into the stratosphere (they are the ozone patterns that go along with the classical ENSO-forced tropical-extratropical teleconnections). At first I did not know what to think about these ozone anomalies because the BDC literature doesn't make any mention of such 'ozone teleconnections'. However, I did some digging, and it turns out that Dick Reed published a great paper back in 1950 that clearly describes this type of transport and its effect on TCO! Schoeberl and Krueger have a very nice follow-up that explains the physical processes clearly using more modern data (see both references at the bottom of this review). You can also see the signature of the teleconnections in other papers, for e.g., most importantly Zhang et al. 2015, but also Olsen et al. 2016 and Oman et al. 2013. However, none of the later three papers I just mentioned discuss the transport dynamics in terms of the ideas of Reed or Schoeberl and Krueger.

Now, as far as we could tell, the waves responsible for the teleconnections are higher wave number than #2, so they are almost certainly evanescent according to Charney/Drazin propagation criteria. Yet despite this, the waves nevertheless extend deeply into the stratosphere (at least to 20-30 hPa?). I am not sure how to refer to this physical transport mechanism, because while the waves involved may also play a role in driving various aspects of the BDC (isentropic mixing and the residual circulation), the column vertical and horizontal advection do not fit into any of the traditional BDC mechanism paradigms. Thus, in our paper we have discussed this type of teleconnection-related transport as distinct from the BDC. That said, I do not feel strongly about that interpretation, so I would leave it open to anyone else for how they want to refer to it. Indeed, I would very much like to hear a compelling argument from you and your co-authors discussing how you think this type of transport should be referred to.

So how does this apply to your paper? Well, in our paper, we are limited to one 'flavor' of ENSO. However, your data covers other ENSO flavors so it would be interesting to know how the ENSO-forced teleconnections affect transport in these other circumstances. Questions to answer and plots to consider making that would be enlightening to see might be:

- If you have the monthly data, can you plot monthly mean ozone (and geopotential height if you have it) on several pressure surfaces (say 200 hPa and 70 hPa) for a each individual month to see how the patterns are different for the different ENSO flavors?

- Using the above plots, how does the phasing of the higher wavenumber PNA-like ozone teleconnections constructively/destructively interfere with the low-wave number climatological planetary wave pattern to produce the results you see? That is, it would seem clear that CP vs. EP El Nino and La Nina should produce quite different interference patterns and resulting transport.
- How does the seasonal cycle differ for the CP, EP, etc flavors of ENSO in terms of ozone teleconnection patterns?

Comment #1 – Figures 3 and 5: I have to admit, I find it kind of hard to envision how the individual processes unfold over the seasonal cycle using the latitudinal averages as you have done. I recognize that you are probably trying to cut down on the number of figures that you have, but I think that having figures similar to Fig. 1 and Fig. 6 make it easier to envision (spatially-temporally) how the ozone transport is unfolding. I will leave this up to the authors, but personally, I would find the it easier to understand using monthly latitude-height plots.

Comment #2 – lines: Is there much of a residual in the ozone budget equation (your Eq. 1) when you compute the individual terms? I am just wondering how well the TEM ozone budget equation closes the total ozone budget.

Minor comments:

Comment #1 – lines: You may want to include a reference to a paper that discusses ENSO diversity from an oceanic perspective, which would give readers better context about how diversity arises and what are its broader implications beyond the stratosphere. Personally, I think the paper by Capotondi et al. (BAMS 2015) is a good reference.

Comment #2 – line 295: I think you have a type in the text *"(not shown o complementary)*."

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