Weather Clim. Dynam. Discuss., referee comment RC1
https://doi.org/10.5194/wcd-2022-34-RC1, 2022

Comment on wcd-2022-34

Anonymous Referee #1

Referee comment on "The stratosphere: a review of the dynamics and variability" by Neal Butchart, Weather Clim. Dynam. Discuss., https://doi.org/10.5194/wcd-2022-34-RC1, 2022

Major comments:

This is an excellent, in-depth review, and I recommend that it be published after minor revisions, detailed below. There are some questions of scope — topics that are not included but could be. I think this is largely up to the author.

Minor comments:

Abstract

Line 7 and other places. Baldwin et al. (2019) established that the mass of the stratosphere (and above) is ~17% of the total mass of the atmosphere. The mesosphere

and above (~1 hPa) is about 0.1%. The 17% figure actually does appear much later in the paper.

1 P1

Lines 20-21 one fifth —> 17%. Also Mesosphere and thermosphere are about 0.1% of atmospheric mass

**There should be a zonal-mean figure showing the stratosphere, tropopause, QBO etc. BEFORE page 3. P3 discusses the QBO, but readers don't yet have a figure of the zonal mean.

Line 70 Baldwin and Dunkerton 1999/2001. The text mentions past two decades.

2.1 P4

Figure 2 panels should go to 1000 hPa, and show the average tropopause.

2.2 P5

Figure 3 should have round panels. Like Figure 5.

Line 154. What is “the advective component of the Brewer-Dobson circulation”?

Line 170. I suggest explaining what a critical layer is.

2.3 P8

Line 188. Is the exclamation point part of the quote?

Figure 6. The panels are slightly different sizes and the (a) and (b) are not the same.

2.4 P10

I suggest deleting the paragraph from l211-217. It does to add much.

2.5 P13

Line 277. It is worth adding to 1979 that satellite observations began then, and before that the data were unreliable.

3 P15

4 p19

Line 445 Lesley Gray did some nice work showing that the upper level QBO may influence the polar vortex.

5 P21

Line 473 has the 17% mass correct!

Line 495 occurrences of SSWs

Figure 14 should be published full page width, in order read the labels.

Line 564 How do you know the QBO is under-represented? Could it not be that the past 65 years have shown a too-strong Holton-Tan relation (compared to a longer period with no climate change)?

6 P27

L595 paragraph. The paradigm shift arose following Thompson and Wallace (1998) who

defined the “Arctic Oscillation” later called annular modes. That led to Baldwin and Dunkerton (1999).

L622. The reference says propagation of information, but what does that mean? Can you re-word this? Information is not a dynamical quantity.

L654. Wasn’t Gray’s hypothesis debunked, and the QBO is no longer used to forecast hurricane frequency?

L686. affected

7 P32

** There should be a reference somewhere to the AMS chapter (Baldwin et al., 2019). You are a co-author. This review parallels the AMS chapter in some ways, although the chapter is from a historical perspective.

** I think that this review should contain more on the dynamical effects of ozone loss, especially in the SH.