

## ***Interactive comment on “Extratropical Age of Air trends and causative factors in climate projection simulations” by Petr Šácha et al.***

### **Anonymous Referee #2**

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This paper analyzes trends in age of air, the stratospheric circulation, mixing and wave driving in CCM output. A novel aspect of the analysis is the inclusion of an adjustment for the change in geopotential height of pressure surfaces. This adjustment explains one of the main features in the age of air trends. The analysis is well done and helps further our understanding of model age of air trends in the recent past and future. My main criticism is on the section describing the individual wave forcing trends that is too detailed and would be better off mostly moved to the supplement. I suggest publication with consideration of the specific comments below.

Specific comments:

Line 16: ‘in the course’ should be rephrased. Maybe ‘associated with’ or something similar.

Lines 17-18: You say that the ‘mechanisms’ of BDC strengthening are ‘well understood’ but also that there are ‘open questions concerning its dynamical driving’. This seems contradictory so it should be rephrased. Maybe by ‘mechanisms’ you mean something different, like ‘features’.

Line 18: ‘accessing’ should be ‘assessing’

Line 21: you should define ‘gpkm’ the first time you use it

Line 23: remove ‘a’ before ‘climate change’. Remove ‘also’ after ‘But’.

Line 25: add comma after ‘Furthermore’.

Line 49: ‘..which makes it difficult to clearly...’

Line 54: ‘accessing’ should be ‘assessing’

Line 55: remove ‘an’ before ‘age-of-air’. Also I think you meant ‘stratosphere’ and not ‘troposphere’

Line 62: ‘In the following sections, where we...’

Line 65: ‘...parameterization schemes and has been used in previous studies...’

Lines 66-67: remove ‘that have been based on CMAM’

Line 71: remove ‘see the scheme in’

Line 74: change ‘us’ to ‘an’

Line 91: change ‘with’ to ‘by’

Line 163: add ‘a’ before ‘daily basis’

Line 172: spell out ‘especially’

Line 179: ‘we state several times...’

Line 186: add ‘the’ before ‘form’

Line 209: 'extratropical' is misspelled. Also remove 'the scheme in'.

Figure 2: Colorbar tick marks are so thick it's hard to see the colors.

Lines 240-245: Really hard to see the changes in trends between the periods due to the different scaling as you mention. You might think about how to adjust this if you really want the readers to see the differences between the time periods.

Line 273: 'the trend decreases with altitude...'

Line 277: 'the trend widens, moving...'

Line 301: 'due to neglecting the variable...'

Line 304: add 'the' before 'next'

Lines 311-314: The description of the trends and how they're shown in Figure 5 is a bit confusing. It took me a while to figure out that you're showing the same value in the blue bars in both the NH and SH sides of the plot, and that the red and green bars don't have to do with NH or SH but only with the different corrections. I would suggest thinking about a different way of showing this. Probably best to have a third plot labeled 'Tropics' that just shows the bars, blue, green and red so it's clear that you're comparing the tropical upwelling flux trends. Then the NH and SH plots could be narrowed quite a bit since they will just have the symbols.

Line 364: add 'a' before 'seasonal'

Figure 6 (and 2): Since you show trends in days/decade in Figure 5 it would be nice to see the other trend figures in those units. Also helpful to label the colorbars in the figures.

Line 390: change 'on' to 'of'

Line 393: change 'from' to 'of'

Line 422: remove 'here'

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Line 433: change 'by' to 'of'

Line 435: add comma after 'Thus'

Section 3.3: This section is tough to get through without getting bogged down in trying to understand all of the different trends shown in Tables 1 and 2 and what they mean. I would highly suggest trying to distill this section and put the tables in the supplement. You really get the main points across in the first and last two paragraphs of the section.

Line 532: change 'week' to 'weak'

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