

## **Reviewer comment on Garfinkel et al. (2016), ACPD:**

Overall, the authors did a good job in modifying the paper by including new figures and improving the text. I do recommend publication now. However, when reading I still detected a few typos and places where I have some minor remarks:

### **Minor remarks:**

p18/124: '...the red curve continues to rise in Figure 9a...'

The trend (of the red curve) is indeed positive, but insignificant as Figs. 10bd show. Hence, the wording could be misleading.

p19/122: '...though the veracity of this assumption should be tested for future work.'

Either your assumption (that in the summertime midlatitude mid-stratosphere equivalent latitude is similar to latitude) is valid, then there is no need to test it further, or it is not - and then you shouldn't use it... I just did a quick look into equivalent latitude calculated from ERA-Interim on 1 August 2013 (12 UTC) at 500K and found that along a latitude of 60°N the equivalent latitude varies between 35°-83°N. Hence, it is not clear to me that your assumption here is a good one... I would suggest to remove the justification of using just latitude (following 'However, ...' in p19/120, and just state the difference to the analysis by Ray et al.

p19/124: In my opinion, the 'GEOSCCM captures the mean age averaged over this period accurately' is too strong. There are clear differences between the simulations and the observations by 0.5-1 yr in Fig. 11 (e.g., around year 2000). Further, the 'mean age in other regions also agrees well with satellite-based estimates presented in Stiller et al. (2008)' is purely speculative. If such a strong statement is to be made the comparison should better be shown.

p21/16: '...and hence the actual response of the BDC to Pinatubo cannot be constrained by existing reanalysis'

Given the good comparison of observed mean age with simulations driven by reanalysis data, in my opinion the wording is too strong. I would suggest to write something like:

'Hence, although simulations driven by ERA-Interim compare well with observed BDC changes it is a challenging question how reliable the BDC response to Pinatubo is represented in current reanalysis data.'

p22/12: 'mean age has increased by 0.15 years'

Where does the number 0.15 in this rather general statement come from? Fig. 7 (all forcing) in NH shows a trend of 0.05 yr/dec, which would yield an increase of ~0.12 yr over 1992-2014. Fig. 11 presents a trend of 0.12 yr/dec at the locations of Engel-measurements. I'm a bit confused here...

### **Technical corrections:**

p2/113: blank missing after 'unchanged'

p7/17: '...for mean age in THE selectED region...'

p8/12: '..can impact THE transport pathway...'

p10/15: '...in te All-forcing ensemble MEAN, ...'

Figure 7: An explanation of the colors in the figure is missing. I'm sure the same colors are used as in Fig. 6, but they should be also explained in Fig. 7.

p18/l22: no blank after bracket '( Figure 4a...'

p19/l17: '...in SECT. 3.1 ...'

p21/l5: '...among reanalysis productS'

p22/l15: better write '...single FREE-RUNNING model...'