**Atmospheric
Chemistry
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Discussions**

Interactive
Comment

Interactive comment on "A new formulation of equivalent effective stratospheric chlorine (EESC)" by P. A. Newman et al.

P. A. Newman et al.

Thanks for the helpful comments. We have added material and clarifying text in response to many of these comments.

First, for the age-of-air spectrum comment, we have added a paragraph on how we calculate fractional release values.

Equations 3 and 4 were a bit confusing, so we have redrafted them slightly. The value of a species at a point in the stratosphere without any loss (rho_i) is calculated in equation 3. The fractional release value is then calculated by differencing this rho_i with the actual observation as shown in equation 4. We have revised our equations and discussion in section 2.

The Delta=0 scenario has virtually no effect. In Figure 6, compared to our standard

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(Delta=Tau/2.) the zero width for a 5.5 year mean age: increases the peak amount of EESC by 2.2% (6a), changes the peak year by 0.6 years earlier (6b), and increases the recovery year from 2067.2 to 2068.8 (6c).

Second, we recognize that the changing fractional release values is a confusing topic and somewhat counterintuitive. We have added more discussion on this point.

In an accelerated future circulation, the mean transit path is approximately the same as the original path, but the air parcel traveling along this path arrives earlier than in the past circulation (typically a change of a couple of months over a 3-year period).

Hypothetical case 1: An idealized gas with a uniform loss rate everywhere in the stratosphere. The fractional release would decrease as the age became younger because it had been in the stratosphere for a shorter time period. This fractional release change would follow the standard release curve (e.g., Figure 11c of Schauffler et al., 2003).

Hypothetical case 2: An idealized gas with no loss in the lower stratosphere and complete loss in the mid-to-upper stratosphere (a good approximation for a CFC). In the faster circulation, air is still cycled through this high-altitude large-loss region, but arrives at a fixed point in the lower stratosphere at an earlier date. The fractional release is exactly the same, but the age is younger by a few months. Hence, in an fr vs. age plot (e.g., Figure 11c of Schauffler et al., 2003), the curve is shifted to the left (or upward for a fixed age). In other words, for a fixed age, the release value becomes higher.

In the GSFC GEOS model output, the change in the fr is a combination of the two hypothetical cases. In the paper, we have used this "combined" case that is consistent with the model changes.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 3963, 2007.

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