

## ***Interactive comment on “Constraining N<sub>2</sub>O emissions since 1940 using firn air isotope measurements in both hemispheres” by M. Prokopiou et al.***

### **Anonymous Referee #2**

Received and published: 17 November 2016

Review for the following manuscript Journal: ACP Title: Constraining N<sub>2</sub>O emissions since 1940 by firn air isotope measurements in both hemispheres Author(s): M. Prokopiou et al. MS No.: acp-2016-487 MS Type: Research Article

The paper is generally well written. I appreciate the effort the authors put in in compiling all available firn air data and make the assessment. I don't have any serious major criticisms on their scientific approach and their interpretations but I do have major suggestions for their presentation. After the major comments are taken, I recommend for publication.

Major comments: 1. Box model calculation: The model parameters that kept invariant are not stated clearly. A table that lists all time independent parameters (cross-

Printer-friendly version

Discussion paper



tropopause exchange fluxes of isotopologues, natural fluxes, and their associated isotopic signatures, N<sub>2</sub>O lifetime, etc) will be helpful. In addition, a comparison with AR5 fluxes is useful. 2. Also box model: The derived time dependent variables. A table that summarizes the derived fluxes and isotopic values (average over a certain period) will be helpful, along with comparisons with other independent work by, for example, Park et al. and AR5. 3. What's the reason(s) behind for the elevated N<sub>2</sub>O flux in year 2008? 4. What's the reason(s) for the oscillating values in source/anthropogenic delta values in Figure 4? Moreover, if I understand correctly, natural N<sub>2</sub>O's are kept constant. I then expect to see the same time variability in anthropogenic as in source in Figure 4, but apparently the two are different. This highlights the usefulness of the major comment #1. 5. In addition to isotopic values, it will be useful and more informative to have isoflux for each process considered. A plot similar Figure 4 but for the respective flux (better also break into each process considered) is recommended.

Minor comments: 1. section 2.5: define all the variables used and no need to define variables not used. For example F<sub>sink</sub> defined but not used. F<sub>exch</sub> used but not defined. Also is epsilon<sub>L</sub> the same as epsilon<sub>app</sub>? Please check carefully the variables in the this section. 2. Line 445, additional decadal variability: raised also above in the major comment #4. What are the underlying mechanisms for the variability? Agricultural activity? Use of fertilizer? 3. Line 492, d<sup>15</sup>N<sup>av</sup>: use the same notation throughout. In the figure, d<sup>15</sup>N is used. 4. Line 495, Fig 5: I believed you meant Fig. 4. Do the corrections for the remaining. 5. Table 3: Is your delta<sub>atm,pi</sub> the same as Park et al.? If not, why not compare? If the same, then say it. 6. Same table, the last column double asterisk: what is it for? 7. Line 604, d<sup>15</sup>N<sub>sp</sub>: not defined. You mentioned in line 36, but the term not defined. 8. d<sup>15</sup>N<sub>sp</sub> is useful, please also show the time series in Fig 4.

---

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-487, 2016.

Printer-friendly version

Discussion paper

