

Interactive comment on “The isotopic fingerprint of the pre-industrial and the anthropogenic N₂O source” by T. Röckmann et al.

Anonymous Referee #1

Received and published: 18 December 2002

General Comments:

The authors present high precision measurements of the ¹⁸O and ¹⁵N isotopic composition of N₂O in firn air samples from two sites in Antarctica. Together with a firn air diffusion model the evolution of these N₂O properties in the atmosphere is estimated. For the first time a significant trend of the isotopic composition of atmospheric N₂O could be significantly determined. When combined with global atmospheric N₂O budget calculations these trends can only be explained by a significant change of the isotopic composition of the N₂O source mix towards more depleted values.

The measurements presented here and their interpretation provide important new constraints on the anthropogenic changes of the global atmospheric N₂O budget. The paper is well written and the conclusions are well justified so that publication is recom-

Full Screen / Esc

Print Version

Interactive Discussion

Original Paper

mended after some minor changes.

Specific comments:

The statement that the atmospheric N₂O increase is purely anthropogenic is too strong in the Abstract. It is not clear to date how much possible (climatic) changes in natural emissions contribute to the observed increase. Same for Page 2024, lines 4 and 7, and caption Table 2.

Page 2024, line 20: "Whereas the internal precisionscatter of the 1999 data." This explanation sounds strange !

Page 2028 Line 18 ff and Table 1: How much do the uncertainties of the firn air diffusion model contribute to the uncertainties of the atmospheric trends and absolute values ?
Line 25: A date should be given for the N₂O source value and atmospheric trend (1998 ?)

Page 2029, Line 6: Eq. (2) is only a (good) approximation of the isotope budget equation, this should be stated.

Page 2030, Line 4 ff: It would be very easy for the authors to provide one more step in the equation for mS to derive the stratospheric budget using the substituted life time (reference "Kaiser, 2002" is not accessible from outside !) Also the tropospheric mixing ratio mT needs to be given.

Page 2032, line 18: In the sentence, "In addition to ...inventories are affected" the reference is not clear.

Figure 2: I am not able to print out the figures with Acrobat Reader, but even when looking at the (amplified) screen I cannot find the dashed red and the dashed green lines (possibly an Acrobat version problem). Steps are 10% of What ?

Technical Corrections:

Page 2023, Line 8: it should better read: ...left an isotope signature change. Line 18:

Full Screen / Esc

Print Version

Interactive Discussion

Original Paper

it should read: ... atmospheric history of the N₂O signatures.

Page 2026, Line 17: ...separation and diffusion "fractionation".

Page 2027, Line 29: ...separation and diffusion "fractionation" alone ...

Page 2030, line 16: ...stratosphere "and" troposphere...

Page 2033, line 22: ...pre-industrial "era".

Interactive comment on Atmos. Chem. Phys. Discuss., 2, 2021, 2002.

Full Screen / Esc

Print Version

Interactive Discussion

Original Paper