

Review of “New technique for high-precision, simultaneous measurements of CH₄, N₂O and CO₂ concentrations, isotopic and elemental ratios of N₂, O₂ and Ar, and total air content in ice cores by wet extraction” by Oyabu, I. et al. AMTDiss..

General:

The manuscript discusses a significantly improved extraction method for sample size without compromising precisions of several important paleo-proxy parameter. The multi-proxy approach is very helpful for improving not only the resolution due to the lower sample amounts necessary, but also regarding the comparison among the different parameters analysed. This again improves the issues with timing, since all the parameters are measured on the same sample, as well as the intercomparison of parameter because only one laboratory and one method is used.

The manuscript is very nicely written with detailed information how the method works and how it is used for standard and sample analyses. Furthermore, the authors show tests that only a very limited number of corrections are necessary which is obviously due to the in-depth selection and preconditioning of all materials used in the extraction, split and measurement lines. They further state how the values are calibrated.

It was easy to read the manuscript and I would like to congratulate the authors. I have only a few rather minor comments and suggestions. I suggest to publish it once these comments have been taken into consideration.

Minor points:

You often used subscripts rather than superscripts in the text. This need to be changed, i.e. $\delta_{15}\text{N}$ rather than $\delta^{15}\text{N}$, or cm_3 rather than cm^3 . Please check any such issues.

Line 137: New header (Description of method and manipulations)

Line 211: Flame Ionization Detector not Frame

Line 293: How are the coefficients d, e and f calculated, how do they relate to a, b and c?

Eq. 6, lines 380ff: what about the sample loss during the first evacuation after loading the sample? Is this neglectable?

Eq. 8: Why is the normalization made to direct atmospheric air and not to a standard that is well linked to the outside air at a given time.

Line 548: ...is impossible to be of atmospheric origin...

Line 603ff: you might cite Huber et al., EPSL 2006