

Direct N₂O “precisely measured at a global network of stations”. Uncertainties known and specified by those sources (e.g CSIRO, NOAA); they spend lots of effort to ensure precision. Not reported here! Would affect e.g. Figure 5!

This reader accepts authors’ claims of massive unique effort to gather and report N₂O information, to “explore the relative temporal and spatial importance of multiple sources and sinks”. Not their job, they correctly claim, to construct an encompassing end-to-end uncertainty budget. But, if this group of experts can not or will not undertake such an effort, who will? My review concedes the effort required but remains dismayed by large unspecified unquantified uncertainties. My challenge / hypothesis stands: “uncertainties remain so large so as to preclude conclusions on specific sources or assigned to specific regions”. Again, who, if not this group, will help us sort such issues?

In opening paragraphs, for example, authors switch between ppm without plus/minus to decadal emissions rates (likewise without min/max designation) to BU source information with min/max. Set aside weaknesses of min/max; why do readers encounter them in some places but miss them completely in others?

Format and labels of figures remain incomplete. Abbreviations applied in Fig 3, for example, remain inconsistent with text and incomplete.

Line 358 delineates data into “three” periods: “1997-2020, 1980-2020 and 2010-2019.” But, at line 320, reader learned that “budgets cover the decades of 1980-89, 1990-99, 2000-09, 2010-2019,”. What?

Line 362: authors claim to “show”; this reader accepts only that they have made best estimates. Term ‘estimate’ frequently used in following paragraphs. A bit of modesty in describing the outcome could have perverse effect of highlighting massive efforts!

Line 1323: something wrong here as EDGAR min and max for N emissions due to energy both equate to 113.3%? Or, next line, to 111.8% and 111.8%. Not my job to chase down this reference! Authors need to ensure correct extraction and citation!!! 300% errors? Sentence following, assigning EDGAR as “very uncertain” seems redundant as well as erroneous? EDGAR folks would disagree? All due to erroneous EFs? No means to estimate reliability of national or regional or global EFs? Fig 18 shows EFs ranging from <1 to >3 for productive agricultural regions across the globe. This reader maintains that Fig 18 invalidates prior effort(s) at regional assignments. Likewise for Figs 19 & 21?

Supplement includes only min-max? (If additional info on statistical uncertainties remains buried in individual descriptions of biogeography models or

atmospheric inversions this reviewer did not find them.) I want to credit authors for adding uncertainty info, but because I did not look at prior Supplement I can not tell.

I admire massive effort to assemble N₂O info from so many disparate sources. If efforts to delineate composite uncertainties have not kept up, that remains mostly a challenge to future research.