

Geochronology Discuss., author comment AC1  
<https://doi.org/10.5194/gchron-2021-11-AC1>, 2021  
© Author(s) 2021. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## Reply on RC1

Benedikt Ritter et al.

---

Author comment on "Technical Note: Noble gas extraction procedure and performance of the Cologne Helix MC Plus multi-collector noble gas mass spectrometer for cosmogenic neon isotope analysis" by Benedikt Ritter et al., Geochronology Discuss., <https://doi.org/10.5194/gchron-2021-11-AC1>, 2021

---

*We want to thank Prof. Rainer Wieler for his valuable and in-depth review of our manuscript, which, from our perspective, improved our manuscript significantly. In the following we outline all changes made, in response on the comments of the reviewer, where appropriate we provide suitable rebuttals.*

19: automatized --> *corrected*

24: ..is equal TO or better --> *corrected*

36: delete "isotope geochronology" --> *corrected*

38: delete "applying" --> *corrected*

44: For THE evaluation of .. --> *corrected*

49: delete one of the "atmospheric" --> *corrected*

52: this not only holds for quartz --> *this is true, however, in this manuscript we focus on the analysis of Ne in quartz for cosmogenic nuclide analysis.*

62ff: There has been quite some controversy recently about the  $^{21}\text{Ne}/^{22}\text{Ne}$  ratio in the atmosphere. If Wielandt and Storey 2019 are mentioned here, also Saxton J.M (2020) J. Anal. Atomic Spectroscopy should be addressed. Also, there is another paper on the issue by the Glasgow group (about which I am sceptical but this is my personal opinion).

--> *We added a citation of Saxton (2020) and Györe et al. (2019) to the manuscript.*

section 2.2., first paragraph: refer to Fig. 1 already at the beginning of this section, when you refer to "the original ...extraction ..line (now the reader has to wait until the end of the first paragraph to find this reference to the figure. --> *corrected*

105: What is the "original" extraction and purification line. Is there any subsequent modification of this line, and who would have provided the "original"?

--> *Corrected to "The Cologne noble gas extraction and...."*

110: MADE of metal --> *corrected*

127f: I had a few problems to follow this paragraph. E.g. what is a fiberlaser? or, e.g..at 131f "heating occurs with a defocussed continuous ...scanning over the lids for 15 min." Perhaps it would be helpful here to start the explanations with the sample revolver (now introduced at 139-142). I even recommend to explain all this with a figure (which might be more instructive than, e.g., the lowermost panel of the present Fig.1, see below). I note that you plan to publish this new furnace elsewhere, but here it will just be very difficult to follow your description.

--> *Modified this paragraph according to the reviewer's comment, starting now with the sample revolver and then describing the laser heat extraction. Line 138-164*

148 – 153, please reformulate, split long sentences. --> *corrected, split the long sentence.*

159ff: where are all these numbers from? The manufacturer? In any case, can it be taken for granted that the isotopic composition for Ne-Xe is exactly atmospheric, and not perhaps slightly fractionated? For example, has this been verified by comparative analyses of noble gases directly taken from air? Or can the manufacturer convincingly guarantee for a negligible isotopic fractionation?

--> *The numbers are from the manufacturer (we now clearly state this in the manuscript). The manufacture does not guaranty the isotopic ratios of Ne, Ar, Kr and Xe. The noble gases were purified via cryogenic separation form air, we assume atmospheric composition for such gases. We have verified within the stated uncertainties this for Ne (using our 'RedAir'). The enriched Helium, the gravimetric mixture is certified by Linde via mass spectrometric analysis, the numbers we report are from Linde (DIN ISO 6141). We added this information to the manuscript. We currently do not use 'Linde' for Ne-calibrations; we use 'RedAir'. Line 172-174*

167: It would be nice to get some additional information about the accuracy of this volume determination. At 174 we learn that the RedAir pipette has a volume of  $\sim 1.5 \text{ cm}^3$ , corresponding to roughly 2 g of air. How large is the mass of the pipette and how well can then the  $\sim 2\text{g}$  be measured as difference of two weight measurements? (I presume for the 8.7 l reservoir the problem will be much less severe?)

--> *The only volume that is calibrated gravimetrically is the assembly of a Swagelok SS-4H valve and a Swagelok SS-4CS-TW-50 miniature cylinder, which was used as the reference volume. All other volumes of the calibration setup (incl. pipettes and cylinders) were determined via measuring the relative pressure drop upon expansion of gases it the respective volumes. We will reword this section (to make clear that volumes are calibrated against a gravimetrically determined reference volume), to avoid future misreading. It would indeed be impractical to weigh the differences of full and empty pipettes or cylinders. We found that one mistake in the original manuscript, the uncertainty for of the pipette volume is ' $\pm 0.006$ ' (i.e.  $\pm 0.4\%$ ) rather than ' $\pm 0.0006$ ' (i.e.  $\pm 0.04\%$ ); we will change the final manuscript accordingly. Line 180-196*

198: "distilled-off in disequilibrium". Explain this in more detail. In 277 we learn that He is removed from the sample gas by pumping during 5 min. Is this the same as what is said at 198? If so, how sure are you that no Ne gets lost in this process?

--> *We now show the desorption characteristics of the coldtrap in a new figure showing that  $>99.9985\%$  Ne is retained at 24K. Line 217*

203: is this liquid nitrogen cooled trap filled with charcoal or another material?

--> *We do not use a liquid nitrogen cooled trap. The closed cycle refrigerated double-cold trap unit used (Janis, twin coldhead model 204) has of one bare (empty) trap and one charcoal-filled trap; the latter is currently not used for Ne separation.*

Fig. 1: In my view, the large lowermost panel is unnecessary, as it does not convey any real information. As noted above, a figure of the furnace would be more instructive.

--> *we rather keep this panel since it helps to visualise the modular nature of the design. As mentioned, a detailed description of the furnace will follow, as soon as another development (which is close to conclusion) that relies on more demanding aspects of the furnace-design, has been published.*

231: explain better what a "VI" is.

--> *LabVIEW programs-subroutines are termed virtual instruments (VIs), which consists of a block diagram, a front panel and a connector pane. In principle it is just the written code/program in the LabVIEW environment. We added '(Virtual Instrument, program codes)'. Line 250*

293: somewhat awkward English --> *corrected*

Fig. 2: Also this figure is not very helpful (it would in any case have to be blown up quite a bit to be readable).

--> *We improved the quality and size of this image.*

255: awkward English (the lid has an opening in the lid). --> *corrected*

261: ..transferred from the glass vials into the cup through... --> *corrected*

277: see 198 --> *see our reply at 198.*

311: please quantify: how much larger is the dispersion compared to the formal analytical uncertainties. This is a bit difficult to see in Fig. 3, as error bars are mostly not shown, and no statement is given in the figure caption whether error bars not shown are smaller than symbol size (as I presume).

--> *Uncertainties are smaller than the symbol size, we added a sentence to the figure caption.*

314: Is the "uncertainty of the mean" equal to the standard deviation/sqrt(n-1)? Or do you mean the standard deviation?

--> *We mean the standard deviation. In instances where we use standard deviation/sqrt(n-1) we specifically state that we calculated an error weighted mean.*

Fig. 5, caption: CGN? This is the first time in the manuscript this acronym is used. It must refer to the Cologne Lab, but what does it mean? Explain please (here or earlier in the text).

--> *This is our abbreviation of our lab CGN = Cologne. We added ..CGN (Cologne) ... in the figure caption.*

Apart from this, your data in this figure look really nice!

357: it would be "BuilT-up" but this is not a good word here anyway, I guess.

--> *corrected and change to .." development of the Cologne...."*