

Atmos. Meas. Tech. Discuss., referee comment RC2 https://doi.org/10.5194/amt-2022-263-RC2, 2022 © Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.

## Comment on amt-2022-263

Anonymous Referee #2

Referee comment on "Laser-induced sublimation extraction for centimeter-resolution multispecies greenhouse gas analysis on ice cores" by Lars Mächler et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-263-RC2, 2022

Machler et al describe a new analytical technique and system for analysis of trace gases in ice cores via laser induced sublimation combined with quantum cascade laser absorption spectroscopy (QCLAS). In my opinion, this system represents a very large advance in ice core trace gas analysis. The analytical precisions are on par with some of the best prior techniques, but the prior techniques required similar or (sometimes much) larger sample sizes for analysis of a single species, whereas here CO2, CH4, N2O and d13CO2 are analyzed simultaneously. The capability of the system in terms of depth resolution is very impressive and is better than what continuous flow analysis (CFA) systems can currently do for trace gases. The system seems very well suited and ready to be used for the stated purpose of generating high-resolution records from the Beyond EPICA – Oldest Ice Core. There is an impressive range of technical innovations / excellent design ideas that have been incorporated into the system. The testing of system is very thorough. The paper is very well written and the results are clearly presented. My only real suggestion for further improvement is to conduct a series of tests with Holocene ice from a relatively highaccumulation ice core where the trace gas species are very well characterized and there is high confidence that no significant changes in concentrations / isotopes are expected. Overall, the authors are to be congratulated on a fantastic new system / technique / manuscript. Below are some very minor suggestions / typo corrections:

Line 39 replace "shortly" with "briefly"

Line 108 change to "sealed glass vessel with a flat base and lid"

Figure 3: include a legend explaining all symbols

Line 161 "combi″ ï□ "combination"

Line 201 "the Byrd ice core"

Line 220 change to "...increase or decrease..."

Figure 5. Clarify: was the photo on the left from a sublimation with P < 0.15 hPa?

Line 270 "from the inner surface"