General comments

Piel et al. describe the development of a cavity enhanced spectrometer for the simultaneous measurement of dioxygen concentration and its oxygen-18 isotopic composition. The instrument performances are excellent, reaching detection limits of 0.002 % for O₂ concentration and 0.06 ‰ for δ¹⁸O(O₂) in 20 minutes. This development is of significant interest to the scientific community, with multiple environmental applications. However, although the manuscript is highly relevant to AMT’s readership and overall well-written, it needs major improvement before being considered for publication.

Specific comments

- The instrument description should be rewritten including: a description of the instrument, showing all the elements currently used in the setup (pressure sensor, flow sensor, solenoid valve, mirror, photodiode) and specifying the product reference if commercial. A point-to-point comparison with the reference article should not be made. A technical scheme and an instrument picture should be provided.
- In the results section, there is not enough explanation of how the tests were conducted and there are no data/figures to justify the conclusions given. The link between allan variance and the time used to carry out the measurements is missing. The measurement strategy used should be explained in more detail.
- When results are given, they should be associated with uncertainties and the supplement should explain how they were obtained and the confidence interval chosen.
- Overall, the manuscript is lacking details. It should be revised with additional data to support the development of the instrument.
- The overall structure of the manuscript should be revised. For some sections, the manuscript is written more in the form of a report than a scientific article. The authors should better guide the reader through their instrumental development methodology.
- There are numerous wordings that need to be revised.
- Greater attention should be paid to defining words and acronyms.
- More references are needed throughout the manuscript.

Technical comments

All small deltas (δ) must be written in italics as “δ”.

Title

δ¹⁸O should be defined: “High precision oxygen isotope (δ¹⁸O) measurements of …”

Short summary

- Line 14: The temporal resolution and precision of measurements should be given.
- Line 15: δ¹⁸O and O₂ should be defined.
Abstract

- Line 19: “(O_2)” should be placed after “Atmospheric dioxygen”. Then, only O_2 should be used throughout the manuscript.
- Line 20: CO_2 should be defined.
- Line 24: “isotopic” should be added between “oxygen” and “fractionation”. “occur” is missing an “s”.
- Line 26: Please add “isotopic” before “fractionation coefficient”. Of which isotopic fractionation coefficient are you talking about?
- Line 25: “(\delta^{18}O(O_2))” should be added after “\delta^{18}O of O_2” and then only \delta^{18}O(O_2) should be used.
- Line 28: Please reverse “OF-CEAS” with “(Optical-Feedback Cavity-Enhanced Absorption Spectroscopy) as “optical-feedback cavity-enhanced absorption spectroscopy (OF-CEAS)”. Capital letters are not necessary.
- Line 33: “instrumental” should be added before “drift”.
- Line 33-35: need to be more quantitative on humidity and O_2 concentration effects.

Introduction

- Line 38: “O_2” should be added after “Dioxygen” and then only O_2 should be used throughout the manuscript.
- Line 48: the \delta^{18}O notation should be defined explicitly. “(\delta^{18}O(O_2))” should be added after “\delta^{18}O of O_2” and then only \delta^{18}O(O_2) should be used throughout the manuscript. \delta^{18}O_{atm} is useless as it is not used later in the manuscript.
- Line 57-59: \delta^{17}O, Ar, and \Delta^{17}O should be defined.
- Line 78: Please reverse “CRDS” with “(Cavity-Ring-Down Spectroscopy) as “cavity ring-down spectroscopy (CRDS)”.
- Line 80: As isotopic ratios are expressed in per mill throughout the manuscript, the associated error should be expressed in the same unit.
- Line 83: same comment as for line 28.

Material and methods

- Line 95: the reference is not cited correctly, should be “described in Morville et al., (2005).”
- Line 97 : What field applications? References should be given to provide examples
- Line 98 : Simply providing a link to the company is not appropriate. More details should be given.
- Line 99 : “Some specific demands”: which ones?
- Line 100: “DFB” should be defined as “implementation using a distributed feed-back (DFB) diode”. Then only DFB should be used.
- Line 108: “the figure” should be replaced with “Figure 1”.
- Line 121-124: Data should be provided.
- Line 124 - 126 : “Instrumental drift, assessed by the Allan deviation as presented below, should then remain below the desired precision level over the measurement time for two samples of which one would be a reference”. This sentence does not bring necessary information.
- Line 142 : What is “working pressure”? Define here your cavity pressure. “as usual” should be removed.
Another improvement is a more accurate, stable and fast control of the sample pressure inside the measurement cell, which is also important for low drift. There is an important lack of information here. More elements should be provided. For example, a figure should be added and comparative values for any improvement of the instrument.

Well known should be removed and references for HITRAN spectral database should be given.

This point will be addressed below. Without going into detail here, a few elements can be given here.

The delta notation should be defined when it is first used in the manuscript, i.e. on line 48. "permil" should be written as "per mill"

"reference sample" of what?

"simple" should be removed and equation numbers should be added

Any equation given in the manuscript should have a number.

How do you obtain the value 35 000?

What is the software used? "This works well", please be more quantitative.

What is the frequency dispersion of the cavity modes? They are not absolutely fixed

References should be provided for the Rautian and Voigt profiles.

"Over the time span of presented results (18 months)". It's not clear what the point of this information is.

Add the cavity finesse value

The symbol “®” should be added for any deposited trademark cited throughout the manuscript. PFA should be defined. N₂ should be defined.

What is the difference between mode (2) line 221 and the routine mode? Why no longer use a trap with magnesium perchlorate?

There is no need for a "-" between "Isotope" and "ratio".

If this manuscript is to be published, the reference given must have been published previously. If this is not the case, further details will be required.

A number should be given to the equation. Besides, the expression to calculate the O₂ concentration should be given explicitly.

“is" should be “of”. More details are needed for the peak jumping sequences.

Results and discussion

Figure 2 and 3: A different colour palette should be used. Black and green are not colour-blind friendly.

This information can be provided earlier and not in the results section.

What is allan deviation? A reference should be provided.

The minimum of the allan deviation is not reached at the same time for the oxygen concentration and the isotopy. The time required to reach the minimum for each species must be given with the precision.

The figure is complicated to understand because of the y-axes

It should be clarified what is considered as a "moderate shift" and “regular measurement."
The time chosen for the measurement must be explained. How was the time interval between each injection of standard selected? The concentration should be kept on the same side of both graphs of figures 2 and 3. Any results from the secondary configuration should be provided in a supplement. Data should be provided to support this statement. A reference should be provided. Overall, the structure of section 3.2 should be revised. The section title should be revised. This sentence needs rewording. A reference should be provided. Overall, the structure of section 3.2 should be revised. Too general, should be more precise. Why every 15 days? The flow rate used for purging must be specified. Any results from the secondary configuration should be provided in a supplement. The overall structure of section 3.5 should be revised which is not appropriate for an article. “small 1σ” should be quantify. This section critically lacks details.

Conclusion
- The unity used throughout the manuscript should be homogenized.
- Further details can be given on the instrument’s application.