

***Interactive comment on “Towards a stable and absolute atmospheric carbon dioxide instrument using spectroscopic null method” by B. Xiang et al.***

**Anonymous Referee #1**

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In this manuscript, the authors develop a novel spectral method to measure atmospheric carbon dioxide with high precision and stability without using calibration tanks during long-term operation. By adopting their spectroscopic null method and using a permanently sealed quartz cell, the instrument stability is greatly enhanced. A long-term stability of  $\sim 0.1\text{ppm}$  is achieved without any calibrations for more than a one-month period. I am impressed.

This is a well-organized, high-quality manuscript with excellent results. However, I suggest publication with minor revisions:

(1) The introduction of the spectroscopic null method is not sufficiently clear to for

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non-expert. Some critical concepts should be explained in more detail, especially the meaning of normalized spectrum, residual spectrum, and spectral fitting.

(2) There should also be a more detailed description and analysis of Fig. 2. The results of purging the optical compartment with dry nitrogen should also be shown in Fig. 2.

(3) The characteristics (LIV curve and tuning) of the DFB diode laser should be described and depicted in a figure.

(4) The schematic of the optical instrument should be more detailed (showing laser, mirrors, reference cell, ...).

(5) All figure captions should be more detailed even if they are explained in the text.

(6) Additional references that related to some of the concepts of this manuscript would make this paper easier to understand.

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Interactive comment on Atmos. Meas. Tech. Discuss., 6, 2055, 2013.