

Interactive comment on “Laboratory Spectral Calibration of the TanSat Atmospheric Carbon Dioxide Grating Spectrometer” by Zhongdong Yang et al.

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Response to Anonymous Referee #2

We thank referee #2 for a careful review and insightful questions and comments. We address his/her comments and questions sequentially as the following:

Q1. On the abstract, lines 10, 13, 14, the authors refers to their results as “notably symmetric”, “excellent consistence”, “good linearity”,... These expressions give no scientific relevance. Numeric evaluation should be given to support these expressions.

A1. We accept this comment, add following numeric results in abstract, which are

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calculated through 1- errors, those errors number are in section 4.1 and 4.2.

The symmetry is better than 99.99%. The consistency in the worst case are better than 99.97%, 99.98%, 99.98% in O₂ A, WCO₂ and SCO₂ bands respectively. The spectral dispersions RMS errors of the fitting residuals are 0.9 pm, 1 pm, and 0.7 pm in the O₂ A band, the WCO₂ band and the SCO₂ band, respectively.

Q2. On the introduction, line 23, the authors refer to “wide dynamical range and a high spectral resolution”. Again numerical values should be given to support the expressions.

A2. We accept this comment, add following numeric results introduction: dynamical range (0.032 - 362.17 mW/m²/sr/nm at O₂ A-band; 0.007 - 60.50 mW/m²/sr/nm at WCO₂ band; and 0.0058 - 15.50 mW/m²/sr/nm at SCO₂ band) and a high spectral resolution ($\lambda/\Delta\lambda$) are 19000, 12800 and 12250 in O₂ A-band, WCO₂ and SCO₂ band respectively.

Q3. There are some grammar mistakes, e.g. line 15; section 2.2; ..

A3. We have corrected the grammar issue.

Q4. It is not clear to me the difference of the calibration method used in this work compared to some others. There is a confuse explanation on the introduction. It looks like the main aim of the work is to characterize and precisely calibrate the sensing results, when the authors also state that they have used a super-high-resolution grating spectrometer for measuring atmospheric CO₂. Please clarify the introduction explanation.

A4. The spectral calibration method used in this work is similar to others, for example OCO and OCO-2, but there are some improvements in our work, for example, in order to improve the efficiency of the spectral calibration, we devised an automatic measurement device that can continuously measure and scan the spectrum continuously without manual intervention. The super-high-resolution grating spectrometer is the ACGS itself in our article, we did not use another grating spectrometer.

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Q5. Section 3.1: Could the authors specify the thermal stabilization used in the measurements?

A5. We didn't specifically carry out the thermal stabilization measurement in the spectral calibration, but our measurements were carried out in TVAC that maintained a small specific temperature range which is the onboard working temperature of ACGS.

Q6. Section 3.1: Could the authors specify (detail) how the Laser speckle was removed using a spinning ground glass disk.

A6. There is no specific work needed to do to this ground glass disk, it is only a common ground disk. Laser speckle was removed using the spinning ground glass disk while reducing the laser intensity by approximately 20%.

7. Scales and typing of most of the figures are not visible, especially in Figure 3.

We have replaced new clear figures.

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