

## ***Interactive comment on “Spectral Sizing of a Coarse Spectral Resolution Satellite Sensor for XCO<sub>2</sub>” by Jonas Simon Wilzewski et al.***

### **Anonymous Referee #2**

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#### <General Comments>

A space borne imaging spectrometer with 50 m spatial resolution is useful to detect enhancement from CO<sub>2</sub> point sources. The feasibility study with real GOSAT data is excellent. The authors are proposing the system with moderate spectral resolution without O<sub>2</sub> A band. GOSAT has high spectral resolution O<sub>2</sub>A band to estimate the light path modification by particles and cloud screening. The authors traded-off the spectral resolution but performance with and without O<sub>2</sub>A is not clear. Did they consider an O<sub>2</sub>A spectrometer with moderate spectral resolution? The authors' interest is city observations. Most of the TCCON sites are not located in large cities and aerosol optical thickness over TCCON locations is usually smaller than cities. GOSAT has measured several data over cities such as Tokyo and LA using its target observation function. The

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authors can pick up and discuss aerosol effect over cities. They also concluded that dust is the largest error source by specifying latitudinal ranges. GOSAT has observed desert area such as Sahara and Arabian Desert with its medium gain. The authors can analyze directly by picking up medium gain data I recommend major revision for publication.

#### <Specific Comments>

(1) Page 1, Abstract The spectral resolution coarser than native GOSAT and the single-band of CO<sub>2</sub> without O<sub>2</sub>A band are both key parts of this study. However, the latter is not clearly mentioned in the abstract.

(2) page 6, Line 18, "non-scattering retrieval", Page 8, Line 9, "the non-scattering SWIR-1 retrieval" Brief description is needed.

(3) Page 6, Line 20, "More than 75 % of all retrievals converge at any given FWHM that we consider in this study." It is difficult to understand

(4) Page 7, Line 19, "1.856%" It is not clear. Is it 1.8% of XCO<sub>2</sub>? 7.4 ppm?

(5) Page 10, Figure 4 Use of three individual figures will become clearer.

(6) Page 16, Line 30 "an additional aerosol sensor may help" The largest error source seems to be vertical profile of particles. Conventional aerosol imager provides horizontal distribution only. Which kind of sensor do authors consider?

#### <Technical Corrections>

(1) Page 6, Line 11 XH<sub>2</sub>O Definition of "XH<sub>2</sub>O" should be described

(2) Page 12, Figure 12 At present, it is monochromatic. It should be a color figure such as figures 6 and 11. Grey line is difficult to see.

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