Response to Reviewer #3

I am afraid I have to reject this paper in its present form, simply because to my opinion the instrument in its present state lacks being fit-for-purpose in any application.

While the simultaneous detection of the three anthropogenic greenhouse gases using just one detector and only He is an improvement compared to previous GC systems, the precision and accuracy is much too poor for any application, most certainly for atmospheric measurements. Compare for instance to van der Laan et al (2009): A single gas chromatograph for accurate atmospheric mixing ratio measurements of CO2, CH4, N2O, SF6 and CO. Atmospheric Measurement Techniques 2, 549–559 (2009). (not cited in the paper). They use two detectors, FID and EC, but they reach precisions : ±0.04 ppm for CO2, ±0.8 ppb for CH4, ±0.8 ppb for CO, ±0.3 ppb for N2O, and ±0.1 ppt for SF6, which are within the reach of the WMO recommendations for atmospheric monitoring. The present instrument gets uncertainties more than two orders of magnitude worse!

If the authors have other applications in mind, soil air or agricultural greenhouse air for example (as several of the papers they cite, and which is hinted at by the values for their reference cylinder with strongly enhanced concentrations compared to ambient), then they should make that very clear in the paper. Furthermore, I think that even for these applications the present quality is not good enough.

The authors should compare their instrument, with a proper, regular calibration scheme in place (periodically, with at least two reference cylinders, preferably more) for a longer time, with a Picarro, or with cylinder air input, and then show the uncertainty (in ppm / ppb), stability and linearity (!) of the system.

Thank you very much for your time and careful consideration of our manuscript and all the critical comments, which will vastly improve the final version if the manuscript in case we get the chance the further work on this submission. We are very sorry that the title of the manuscript was misleading – definitely the “atmospheric level measurements” was not the appropriate statement. We initially aimed to test if our system is suitable for this aim, and had to show in the manuscript that the precision for this is too low. But unfortunately we have not reviewed the manuscript title at the end. We are mostly using the system not for monitoring slight atmospheric variations but for determination of environmental GHGs fluxes, like soil chamber measurements, laboratory incubation studies, fermentation experiments.

We definitely agree with the reviewer's opinion that we have incorrectly titled this work and made a wrong emphasis on the atmospheric level measurements. This could be one reason that the manuscript is perceived as very misleading and suggesting the new GC system for long-term GHG’s measurements at ambient levels. But definitely our GC system is not dedicated specially for ambient air, but could be useful for determination of possible sources of atmospheric GHGs.

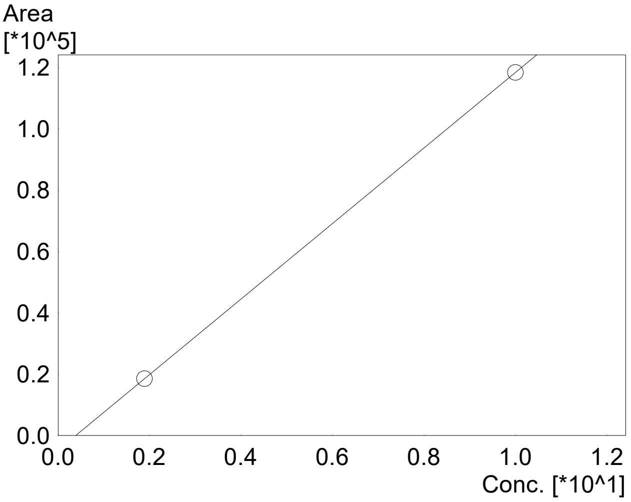
First of all, the levels of precision we have achieved are certainly not even close to those presented in the work of van der Laan's et al (2009). Sorry, we have not found this publication before, in case we would get the chance to prepare the corrected version of our manuscript, this citation will be added and the amazingly high precision of this system will be emphasized. Our method was not designed according to official, WMO recommendations – it is rather the method for fast and cheap detection of GHG's levels at wide range of concentrations. It can be used in agricultural and soil science as well for checking the samples of unknown origin, to determine the presence and concentrations of GHG in range from 0.4 ppm to 0.4% using BID. Using TCD it can detect higher concentrations of GHG's up to 100%. This is the main advantage of proposed system – it is a very simple and relatively cheap application with high flexibility (wide concentration ranges can be measured).

The method which we proposed can have very wide application. Moreover, since the idea is quite new and the system is developed in the past year we would like to share this idea with scientific community at the current state of development, because we know that there is an interest in some research groups to work on similar solutions. If we are allowed to prepare the corrected version of this manuscript we will emphasise that the precision is not sufficient for ambient measurements, method is not perfect and needs further developments, and will give some recommendation of possible enhancements. We believe that even an information on the low precision of this method can be useful for the community – if anybody would have a similar idea, in our manuscript he/she can find a base on how to make such measurements possible and which precision is attainable. It may help to decide in advance if such performance is adequate for his/her aims or not. Such scientific papers are also important, because we bought the system actually as able to reliably measure GHGs, but the exact precision was not known. Since we have tested this for the first time, we believe that it is worth publishing , so that the researchers could check in the literature if the promises of the instrument suppliers are true.

We have to kindly disagree with the statement that our GC system could not be applied in any science or industry with success. We tested this system for soil gases emissions as well as gases from incubations experiments (lignite matter biodegradation experiments or denitrification experiments), samples collected from different industrial sources – gas emissions form wastewater of yeast factory, air samples form Upper Silesia in Poland (coal mining region). Every time before sequence of samples measurement we used calibrated gases directly connected to autosampler (1. Certified reference standard gas from Messer, 2. Compressed air). In the corrected manuscript we will emphasise these applications and provide practical examples. As a response for the questions of reviewer, we attached below the example of calibration lines with information regarding R^2 and linearity of calibration line, used for test in this study. This will be also added in the corrected version of the manuscript. We believe that this system has significant potential in the future not as the world's most precise instrumentation for ambient measurements but as simple device for detection of GHG's gases in large range of possible concentrations, hence dedicated for flexible and distinct applications.

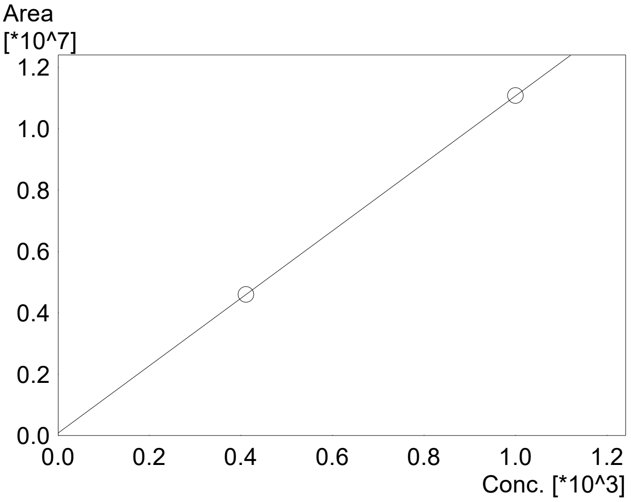
==== Shimadzu LabSolutions Calibration Curve ====

ID# : 1
Name : CH_4
Quantitative Method : External Standard
Function : f(x)=12311.1*x-4753.88
Rr1=1.000000 Rr2=1.000000 RSS=2.448455e-021
MeanRF: 1.081909e+004 RFSD: 1.094662e+003 RFRSD: 10.117873
FitType : Linear
ZeroThrough : Not Through
Weighted Regression : None
Offset Correction : Off
Detector Name : BID1



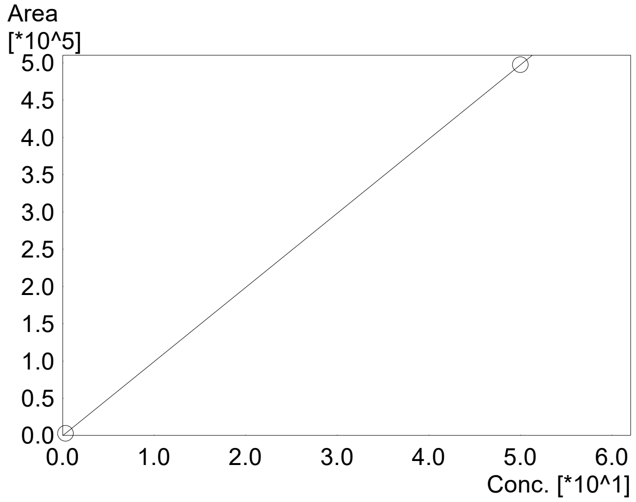
#	Conc.(Ratio)	MeanArea	Area
1	1.895	18576	19012
			18745
			18159
			18387
2	10	118357	118483
			118292
			118202
			118452

ID# : 2
Name : CO_2
Quantitative Method : External Standard
Function : f(x)=10996.0*x+83666.7
Rr1=1.000000 Rr2=1.000000 RSS=1.734723e-017
MeanRF: 1.113963e+004 RFSD: 2.371616e+002 RFRSD: 2.128990
FitType : Linear
ZeroThrough : Not Through
Weighted Regression : None
Offset Correction : Off
Detector Name : BID1



#	Conc.(Ratio)	MeanArea	Area
1	411	4603028	4573051
			4593812
			4643402
			4601846
2	1000	11079679	10722396
			10855456
			11335187
			11405676

ID# : 3
Name : N2O
Quantitative Method : External Standard
Function : f(x)=9955.50*x-443.654
Rr1=1.000000   Rr2=1.000000   RSS=1.861156e-024
MeanRF: 9.296704e+003 RFSD: 7.011233e+002   RFRSD: 7.541633
FitType : Linear
ZeroThrough : Not Through
Weighted Regression : None
Offset Correction : Off
Detector Name : BID1



#	Conc.(Ratio)	MeanArea	Area
1	0.339	2931	2962
			2934
			2966
			2864
2	50	497331	495410
			499285
			496310
			498320