We thank the reviewers for very thorough and constructive comments. The quality of the manuscript has been improved by these comments and suggestions. The following are our responses to the comments. The response (in blue) follows each comment.

Reviewer #2 (amtd-7-C1391-2014):

Detailed Response
The specific issues will now be addressed in detail.

1) There are too many basic grammatical errors in the paper to be corrected by the referee. The authors must rewrite the paper to a suitable standard.

Answer: Apology for inaccurate expressions, we have rewritten the paper and invited some experts to revise it. The paper has a great progress.

2) The authors refer to an optimal estimation method. The paper does not address any details about how they implement this comparison method. Is this similar to the optimal estimation methods used by the closely related NDACC network, namely SFIT4 and PROFFIT? Incidentally, the method used by TCCON, using the GFIT suite of software, is a non-linear least squares fit. A more basic question is why develop such a method in the first place. Is it the intention of the authors to use this DOAS like method instead of a full line-by-line radiative transfer calculation used by GFIT?

Answer: The OE method refers to the spectral fitting in the whole band, rather than other inversion algorithm, such as SFIT4 and PROFFIT. Comparisons of this method and that of TCCON are added in this revised version. We are not trying to replace the SFIT4 and PROFFIT. The molecular absorption in DOAS-like is also based on line-by-line radiative transfer calculation.
Because a Chinese CO_2 observing satellite will be launched into space in 2015, we are planning to setup some new ground-based (passive) remote sensing instrument to derive the CO2 column amount from measured spectra, and then to validate the Chinese satellite products in the future.

3) New method: for the new method to be acceptable to the community, and by this it is meant the TCCON community, it must be demonstrated that this new derivation of XCO2 has at least the same precision and accuracy as the current dry-air-mole fraction (XCO2). The authors do not formally define what they mean by XCO2 in the paper; it is introduced in equation 9 but not clearly defined. This also applies to NCO2, which is not the number of CO2 molecules as stated on line 5 of page 2409, but the column (molecules cm-2). While the surface pressure is known quite accurately and in principle is more precise than the O2 column, by ratioing the CO2 column by the O2 column there are a number of systematic errors that are removed (for example pointing
errors of the solar tracker and instrument lineshape errors to name two). This is the method adopted by TCCON so how does this modified DOAS method deal with these issues?

Answer: Thanks for the comments. You are right, N_{CO2} is the number of total number of CO_2 per

surface area. For a fixed air condition, the N_{CO2} is linear related to the X_{CO2}. The X_{CO2} in this paper is also column-averaged dry-air mole fraction of CO_2, the formulas have been rewritten for clear understanding.
As you say, result on the DOAS-like method shown in this revised version is the very preliminary. Some error sources, e.g. the pointing errors of the solar tracker and instrument line shape errors, are still not taken into account, but will be considered in the future. Anyway, the first results shows that the DOAS-like method may be another way to derive the X_{CO2} from ground-based measurements of the direct solar beam.

4) This leads to another issue with the paper; while it is good and necessary to compare their derived XCO2 with GOSAT (section 4), it would make much more sense to also compute the XCO2 as derived with the official TCCON software. The software is freely available. A direct comparison of the two different ground-based XCO2 products would be very instructive exercise for the purposes of this paper. The authors should also note that the Bruker 125M instrument is not currently an accepted instrument for TCCON work as it does not meet the strict TCCON requirements, rather, the Bruker 125HR is used throughout the network.

Answer: It's a good suggestion! We have used TCCON spectra measured and X_{CO2} in Tsukuba, Japan (36.0513N，140.1215E) and Bremen, Germany (53.10N，8.85E) to validate DOAS-like algorithm, the results are shown in section 3 of the revised version. It shows that after airmass correction, the results agree very well with those of TCCON.

5) Why would the selection of channels eliminate aerosol scattering effects? If this data is in the direct solar beam then these are very much minor effects, which can be ignored. Given the comments above about the use of O2 to produce an XCO2 as defined by TCCON, would it not be possible to modify the approach here to select appropriate pairs of lines in the O2 band and produce an XCO2 that would eliminate the systematic errors also alluded to above? This would be another interesting exercise and an important test of this method.

Answer: The multiple scattering effects in the direct solar beam are too small to be ignored and we have removed these descriptions in the first paragraph of section 2.3.
Using O_2 to produce an X_{CO2} is an good way to eliminate some systematic errors (for example the pointing errors of the solar tracker and instrument line shape errors), which will be taken into accounts in DOAS-like in the future.

6) Why does the optimal estimation method, as it appears in figures 5, 6, and 7 have less sensitivity to temperature and pressure? There are no details given on the optimal estimation, but in principle the method should be sensitive to the spectral information like any other method depending on how it is implemented of course. This needs to be fully described.

Answer: The OE method refers to method of spectral fitting in the whole band, rather than SFIT4 and PROFFIT.
More details of dependence on the temperature and pressure are described in 3rd and 5th paragraphs of section 2.3.