I feel the discussion in Subsection 3.7 in the main paper and reply in Page 7 is largely inconsistent.

Thanks for the comments.

The "inconsistency" is mainly due to the different purposes and the specific concentration fields discussed. Subsection 3.7 in the main paper discusses the concentration difference, i.e., the column-integrated $FFCO_2$ concentration by cyclic emissions after subtracting the column-integrated $FFCO_2$ concentration by constant emissions. The purpose of the section is to investigate how the cyclic emissions modify the column-mean $FFCO_2$ concentration.

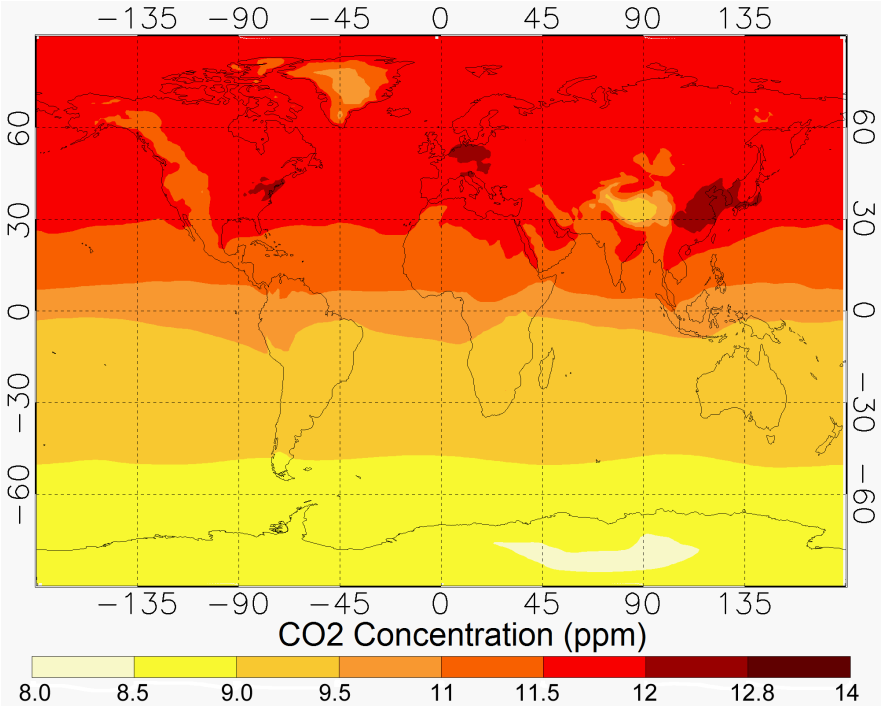
By contrast, the reply in Page 7 talks about the simulated $FFCO_2$ concentration alone, i.e., the column-integrated concentration by all-cyclic emissions. This is to reply to the referee's comment, which we would like to put here: "how will then people claim that they can track megacity fossil emission from space. Can you show the mean column averaged $FFCO_2$ map for one of your simulation – I am curious how elevated the column-CO_2 appear due to $FFCO_2$ emissions alone."

In particular, the 13 ppm as referred in the reply is not what makes the megacity emission detectable! It is the gradient from neighbouring grids that is the signal for megacity emission, which is a fraction of a ppm at the most for Beijing, and practically non existing for Los Angeles, European cities and other megacities.

Thanks for finding out. We agree that the concentration from megacity emissions is not detectable. We had partly misunderstood the referee's original comment, and our previous interpretation focused solely on the concentration magnitude itself while ignoring the concentration gradient. We agree that a concentration up to 13 ppm cannot make the megacity emission detectable, and the concentration gradient is as small as a fraction of 1 ppm from the neighbouring grids. We also agree that the megacity emission doesn't exist in cities such as Los Angeles, European cities and other megacities.

We would like to modify the previous response as follows:

This study doesn't show large difference in the column-integrated $FFCO_2$ concentration between the megacity emissions and the neighbouring area, which indicates the megacity emissions cannot be well detectable from the space. As shown in the map, even though the concentration is up to 13 ppm, the gradient is only a fraction of 1 ppm from the neighbouring grids. Also, the gradient doesn't exist in some European megacities, Los Angeles other megacities.


−135 −90 −45 0 45 90 135
60 30 0 −30 −60
CO2 Concentration (ppm)
8.0 8.5 9.0 9.5 11 11.5 12 12.8 14