Interactive comment on “A study of synthetic $^{13}$CH$_4$ retrievals from TROPOMI and Sentinel 5/UVNS Part 1: non scattering atmosphere” by Edward Malina et al.

Anonymous Referee #2

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The manuscript presented a study on retrievals of 13CH4 from TROPOMI and Sentinel 5/UVNS. It is well written and very informative. I suggest it be accepted from publication after minor revision.

Major comments:

1. Although reference papers are provided, I think it is helpful for the reader if the authors can provide a clearer description of the remoTeC algorithm, for example, the components of the state vector etc.
2. More explanations about why the average kernel for 13CH4 is different from 12CH4 are also welcome.
Minor comments:

1. Line 21, Page 1: 'The disagreement ...' The bottom-up approaches have large uncertainty as well.

2. Line 22, Page 1: 'or incorrect transport ...', There also are large uncertainties in modelling CH4 chemical losses.

3. Line 15, Page 3: 'Parker et al.,...', Works by Frankenberg et al., 2005 and 2011 should also be cited.

4. Line 10, Page 5: A comparison of 13CH4 and 12CH4 absorptions at different atmosphere levels can be useful for the reader to understand the different sensitivity of the TROMOPI instrument to their abundance.

5. Line 28, Page 6: '...and that is potential...', The whole sentence is not clear.

6. Fig 1: no unit shown for Jacobian. Also, no right-hand scale for 12CH4.

7. Line 5, '...errors in Figure 4..'. Some explanation about the spots with high uncertainty (>1.5 ppb) will be helpful