

Interactive comment on “Geostationary Emission Explorer for Europe (G3E): mission concept and initial performance assessment” by A. Butz et al.

Anonymous Referee #2

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General comments

This paper presents a mission concept for a geosynchronous satellite sounder with the goal of constraining the sources and sinks of two major green house gases at a impressive spatial resolution. This high resolution will allow for the identification of points sources, such as power plants, for emission monitoring. It is unfortunate that the technique is limited to continental areas as ports and sea shipping routes are also of great interest.

The work presented in the paper presents an initial performance assessments for such a mission and is certainly within the scope of AMT. The methods and assumptions used in the assessment are clear and reproducible, although some minor clarifications would

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be helpful (addressed in the Specific comments section below). The interpretation of the assessment results are thorough and well supported. The paper is appropriately structured and the title is fitting. Citations were used when appropriate and where of an appropriate number and quality.

However there are issues with the quality of language. The paper is of need of a thorough editing which would greatly improve the readability and clarity. I will highlight some of the issues in the Technical corrections section, however further review is still be necessary.

Specific comments

1) Only two error sources are examined in this work while no comments are made about other possible sources of error. It is important to at least address the relative contribution of other uncertainties such as forward model parameter errors (temperature profile, spectroscopy...) would have on the retrieval. If they are small compared to the measurement noise and backscatter that should be mentioned and if not, the impact of the uncertainties should be remarked upon in further detail. Also note that in the conclusion it is claimed that “retrieval algorithms can deliver XCO₂ and XCH₄ with accuracy in sub-percent range for the majority of cases”. This seems to be an overstatement when no other sources of error are considered within this work.

2) In the Prospective noise performance section, the choice to use the same model to simulate and retrieved the concentrations should be discussed in further detail, particularly when in the particle loaded section the use of different models in the simulation and retrieval phases is emphasized.

3) Why choose to calculate aerosol optical particles use a Mie model with spherical shape of particles? More precisely, why spherical? What effect does the shape have on the optical thickness? How does this affect the assumption of hexagonal particle size in the retrieval model?

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Technical corrections

- 1) “Thereby” is mostly misused within the paper, it means ‘by means of’ and is not a synonym for “thus”.
- 2) Page 6950, line 9 Rephrase “... including sampling of diurnal...”. Should be separate sentence.
- 3) Page 6950, line 26 Rephrase “... (MTG) satellites suggests making”. Instead of “suggests” perhaps use “makes possible” or “has the potential”
- 4) Page 6952 line 9 Change “ten km²” to “tens of km²”
- 5) Page 6952 lines 16 - 19 Sentence is too long and unbalanced. Consider separating for clarity.
- 6) Page 6953 lines 1 -3 “exploiting diurnal concentration cycles...” To do what? Needs clarification.
- 7) Page 6953 line 7 Change “to support” to “of supporting”
- 8) Page 6953 line 19 Change “green house gases XCO₂” to “green house gases of XCO₂”
- 9) Page 6954 line 7 Change “ which are in particular the . . .” to “which are the”
- 10) Page 6957 line 25 Change “to be traded” to “to be balanced”
- 11) Page 6960 line 10 Change “For our noise assessment here, this is of no relevance” to “However this is not relevant for our noise assessment study.”
- 12) Page 6960 line 12 Change “ensemble here.” to “ensemble.”
- 13) Page 6960 line 18 Change “860 nm representative” to “860 nm as representative”
- 14) Page 6961 lines 13-14 Change “assessment here is consistent among the retrieval” to “assessment is consistent between the retrieval”

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- 15) Page 6962 line 4 Change “identified a major” to “identified as a major”
- 16) Page 6963 line 6 Change “much alike” to “much like”
- 17) Page 6963 line 8 Change “extends from” to “extended from”
- 18) Page 6963 line 15 Change “particles scattering” to “particle scattering”
- 19) Page 6963 line 19 Change “Like for” to “As in”
- 20) Page 6966 line 8 Change “calculus” to “calculation”
- 21) Page 6967 line 7 Change “Beside” to “Besides”, or “In addition to”
- 22) Page 6967 line 18 Change “yields” to ”yield”
- 23) Page 6968 line 5 Change “performance the” to “performance for the”

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