Atmospheric
Chemistry
and Physics
Discussions

Open Access

Interactive comment on "Variability of tropospheric methane above the Mediterranean Basin inferred from satellite and model data" *by* P. Ricaud et al.

Anonymous Referee #2

Received and published: 16 June 2014

This study presents results of a comprehensive analysis of atmospheric methane distributions over the Mediterranean Basin in the troposphere using both satellite measurements and model simulations. Multiple instruments with varying measurement technique as well as global chemistry transport model and chemical climate models are utilized in the analyses. I found the contents of this study fairly presented and the general subject of this work has scientific significance. However, the overall structure of the paper seems to be rather poorly constructed. Below are my comments for the authors may take into consideration for improving clarity of this manuscript.

General Comments:

1. What is the motivation of this work? Apart from the satellite retrieval issues, why the Mediterranean Basin is important? Why are you looking at methane total column data from IASI and methane profiles from AIRS? Why did you include GOSAT data even though there are only few good measurements available? Why are you using model outputs from three different models? Is the purpose of this work to present model inter-comparison? The selection of all the method and data used in the study has to be justified, preferentially in the introduction.

2. What is the main goal of this study? The authors seemed to have their main focus on the satellites and model description rather than new findings about methane climatology and transport. If the goal of this paper is to describe the data and the model, there is not much exciting science to be claimed. If the authors' intention was to focus on the methane climatology, the overall structure of this paper has to be reconsidered.

3. The background of methane climatology, seasonal variability in the troposphere including what has been done or what has not been done (e.g., previous literature), why measuring methane from space is important but difficult has to be clearly mentioned. Each figure containing methane distribution has to have its own clear point, separately. In my opinion, section 3 seems to be the most important part of the paper but the inclusion of the figures are all lumped together, which makes it hard to follow the authors' explanation.

4. There seems to be lack of supporting evidence or explanation showing strong connection between methane distributions and meteorology (transport). I recommend the authors only include the wind fields when they are needed and showing clear correlation with the tracer fields. For example, Fig. 1 is a very busy plot with many arrows. Either removing the horizontal grid lines or change the color of them to gray would make the arrow look more dominant.

Specific Comments:

1. P9977, L28 – we can conclude -> we conclude

2. P9978, L2 – Is this true for the all seasons?

3. P9978, L13 –Does the net impact refer to net radiative impact?

4. P9978, L24 – very variable -> variable

5. P9978, L25 – Beside this -> Besides this

6. P9978, L25 – P9979, L2 – The meaning of this sentence is not clear. What do particularities and differences mean?

7. P9979, L28 – In parallel. . . (This can be a new paragraph).

8. P9980, L3 – Acronym (ACCMIP) should be mentioned.

9. P9980, L6 – recent studies (Ricaud et al., 2009) – only one study?

10. P9980, L12 – What is the time period of ChArMEx?

11. P9980, L14 – proposed by France – Does this mean it's only proposed or it's being conducted as well?

12. P9982-, section 2 - The model and data description can be shortened by keeping the information only needed for this study. Currently, there is too much general information in section 2.

13. P9982, L3 – This sentence can be rewritten. 'Surface emissivity on the sea is relatively smaller in magnitude and spatially uniform compared to the one over land'.

14. P9982, L10 – The meaning of 'somewhat consistent' is vague.

15. P9982, L24 – Does this mean NCEP/NCAR reanalysis?

16. P9983, L12 – Brief explanation of 'feed-forward artificial neural network' will be helpful.

17. P9983, L24 – associated to -> associated with

18. P9984, L3 – Roughly, how many profiles are contaminated by cloud and excluded (per day or per region)?

19. P9985, L4 – gases research -> Does this mean that this satellite is a research satellite?

20. P9985, L25 – How many profiles are used in each bin?

21. P9986, L24 – It is not clear if the emissions used in the model run are yearly or monthly averages.

22. P9987, L13 – I wonder why convection is not included in this study and what this mean to the results presented here?

23. P9991, L15-21 – The meaning of this sentence is not clear. Multiple shorter sentences with clear key point rather than one long sentence will be desired.

24. P9991, L21-25 – Long-range transport from Asia is not convincing unless backward trajectory model or something equivalent is used.

25. P9992, L25 – Does this mean MOCAGE is sampled like AIRS (horizontally) as well?

26. P9993, L4 – very consistent -> consistent

27. P9993, L5-7 – I don't think the difference between AIRS and MOCAGE is only related to a-priori. Global models known to be underestimate mixing ratios of trace species largely due to coarse horizontal resolution and large uncertainties in estimated surface emission.

28. P9994, L20 – E-W maximum -> maximum in E-W gradient?

29. P9994, L26-28 – Why the amplitude of seasonal cycle is consistent even though the absolute values are different?

30. P9996, L19 – We can note -> We note

31. P9996, L22 – issue -> topic or subject

32. P9998, L17 – non-zonally-symmetric -> zonally-asymmetric

33. P9999, L25 – 'somewhat consistent' is a vague description.

34. P10000, L17 – we can -> we

35. Fonts size for the figure titles and color bars has to be bigger than the one currently used.

C3692