

## ***Interactive comment on “Gridded maps of geological methane emissions and their isotopic signature” by Giuseppe Etiope et al.***

**Anonymous Referee #1**

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Gridded maps of geological methane emissions and their isotopic signature Giuseppe Etiope et al.

This paper attempts to fulfil the very real need for a global evaluation of geological sources of atmospheric methane – a generally understated and commonly overlooked source of this important Greenhouse Gas. The authors have undertaken the daunting task of summarising the methane emissions in a logical way – subdividing the planet into a 1° x 1° grid, and populating this grid with the data from four logically-selected categories of natural geological methane source. Available data from each grid square are summarised by two values for each category: emission strength and carbon isotope – again, a logical approach. The data set is thus a valuable resource for those interested in global Greenhouse Gas emissions for modelling, or whatever purpose.

C1

Inevitably there are shortcomings to this approach: – the number of source references (published papers, reports etc.) is vast: most, but not all, have been utilised. Table S4, for example, is not complete. – there is an enormous volume of data acquired by, for example, the petroleum industry, which has not been released to the public domain, so the data set cannot be comprehensive. – such data sets are never complete. As soon as a compilation is completed, more source references appear. For the above reasons it would perhaps be appropriate to recognise this a ‘provisional’ attempt to evaluate global geological methane emissions. However, I believe it be the only one available, and in its present form it is more than adequate to demonstrate the significance of geological sources of methane.

Are there plans to maintain and update the data set?

These comments do not detract from the value and usefulness of this data set. It is presented in a suitable format for use on GIS systems etc., and the paper adequately describes how the data set was generated. To the best of my knowledge the data set is unique, compiled in an appropriate manner from data of suitable quality.

Rating: 2. It falls short of 1 only because of the shortcomings identified above.

Specific comments: p3 l20: four major categories: is it worth noting here that other sources (e.g. deep water seeps) do occur, but are less likely to be responsible for direct methane emissions to the atmosphere?

P3 l23: Submarine (offshore) seeps: presumably this includes offshore mud volcanoes; if so this should be stated - if not they should have been included either here or in a separate category.

P3 l26: diffuse microseepage: presumably this category is exclusively onshore - this should be stated.

P4 l 24 onshore cells without OS, GM or MS sources?

P16 l24 The double-sided Grubs test should either be explained or a suitable reference

C2

should be provided.

P16 I28 “as limit” – or “as the limit”?

P25 I 14 (Table 5). The distribution of submarine seepages: “unknown % of global coverage (likely >80% ?)”. What does this mean? If this means that more than 80% of the global distribution of submarine seeps is accounted for in the data set, I strongly dispute this. I suspect that many more than 20% of existing seeps and seep areas remain undiscovered (or are discovered but unreported).

The Supplement is first mentioned on p4 I8 –instructions on how to access it should be provided here and on p20 I20.

Technical comments: General: – standardise “per”: e.g. “Tg year-1” OR “Tg/y”. – “ad hoc” is correctly in italics. “et al.” should also be in italics. – Several occurrences of “et al” should be corrected to “et al.”

p2 I30: Bergamaschi et al. 2014: listed as 2014 in References

p3 I32: Etiope et al. (2007) not in References

p6 I 26-7: “OS emissions in the order of . . . .” Clumsy wording. Suggest: “There is a total of 76 OS with emissions in the order of 104 t CH4 year-1 . . . .”

p9 I1: California is in the USA!

p11 I10-11: Klusman et al. 2008 – not in References.

p11 I 28 “Sciarra”: written “Sciarpa” in References. Which is correct?

p15 I24: Global Volcanism Program (2013): details of this should be included in the References

p15 I38 AND p16 I 6 Etiope et al (2007) not in References.

p16 I16 Procesi et al. – details should be added to References.

### C3

p17 I9 – there is a superfluous fullstop [“.”] at the end of the line.

p19 I31 “JBC/PBL”: should this be “JRC/PBL” as in References?

p22 I39 “breathdglobal” should be “breath global”

p22 I50 should Las Animas and Huerfano counties have capital leading letters?

The following appear in the References, but are not cited in the text: – Le Quéré et al., 2013 – Etiope, Baciú, Caracausi, Italiano & Cosma, 2004 – Etiope, Christodoulou et al. 2013 – Etiope Doezma & Pacheco, 2017 – Etiope, Feyzullaiev et al. 2004 – Etiope & Schoell, 2014 – Saunio et al. 2017 – USGS World Energy Assessment Team, 2000

I have not gone through the Supplementary References so I suggest that the authors re-check that it is correct and complete.

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