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Interactive comment on "Cryptic role of tetrathionate in the sulfur cycle: A study from Arabian Sea oxygen minimum zone sediments" *by* Subhrangshu Mandal et al.

Anonymous Referee #1

Received and published: 16 July 2019

Cryptic role of tetrathionate in the sulfur cycle: A study from the Arabian Sea oxygen minimum zone sediments.

General comments:

The paper investigated the role of tetrathionate as an intermediate in the redox cycling of sulfur in sediments from the oxygen minimum zone from the Arabian Sea. Using metagenomics approach, the authors find the presence of tetrathionate generating, oxidizing or reducing genes and identify bacteria potentially responsible for such processes. Through slurry incubations, the authors show the involvement of tetrathionat in the microbial sulfur cycle in these sediments. Tetrathionate itself was not detected

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in-situ most, likely due to its reactivity. The authors propose pyrite and/or thiosulfate as potential sources of tetrationate, which is subsequently oxidized or reduced in the system.

The sampling approach is rather unusual (subsampling of oxidation critical subsamples from split-cores, see comments below). In addition, the description of the different subsamples are not entirely clear to me, which is most likely a formulation issue (see details below).

Description of the analytical methods are not precise (see detailed comments below).

Large parts of the text, especially in the results and discussion part should be rewritten and be more concise. The manuscript contains unnecessary text and phrases, which make reading complicated. Many sentences are too long and sometimes the grammar is not correct such that understanding is in parts not possible. Some examples (but not all) are pointed out/detailed below.

The figures should be better implemented and explained in the text where appropriate. Downhole analysis of chemical species could be visualized in a depth plot to provide a quicker overview for the reader. The data table can be part of the supplement. Results from the slurry incubations could be presented in an additional figure instead of (or in addition to) the tables. This would help understanding the complex results. From reading it seams very random when and in which samples e.g. tetrationate is oxidized and at what rates. I strongly suggest splitting results and discussion, this would help to sort out the text and help the reader understanding the story. There is also almost no discussion of the results rather than a presentation, e.g. there is no discussion of the determined rates and what they indicate etc... .

Collectively, I think this manuscript needs a major overhaul with focus on precise description of the sampling and methods and separation of results and methods including a proper and streamlined discussion, before the scientific merit can be judged. The extend of required rewriting including methods, results and discussion extends

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what is justifiable as a revision. However, I would emphasis a re-submission as a new manuscript once rewritten.

In the following I provide many details, but this may not be complete.

Specific comments (incl. few technical comments):

Abstract

Line 25: introduce msbl, also: no dash between number and unit (msbl) here.

Lines 27/28: I suggest to be more precise and name the processes instead of generally speaking about “these metabolisms” or “these processes”

Line 29: Provide conditions of the incubations under which you could observe tetrathionate generation or turnover. (What types of slurry-incubations, i.e. with amendment of tetrathionate or thiosulfate. . . etc.)

Lines 31/32: Can you calculate a molar concentration or g/sed for iron and manganese instead of giving ppm

Line 34: instead of “converted” use “oxidized” here and throughout the manuscript (similarity use “reduced” if applicable)

Line 35: delete “back”

Line 35: avoid “0” as a concentration, it reads odd. 0 means absence, so 0-2 mM present is wrong as 0 means not present. You could write e.g. up to 2 mM

Introduction

Line 45: delete “running”

Line 48: delete “So”

Line 54: Delete: “In this context” – unnecessary

Line 55: replace/reformulate “seldom appreciated” by rarely investigated or similar

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Material and Methods

Line 77: delete “the”

Line 78: delete “on which the present study is based” (unnecessary text)

Lines 81ff: The sampling strategy is unusual. Oxidation sensitive sample were collected after splitting the core into two halves. To prevent oxidation a shower of N2 was applied. How was this realized to ensure that no oxidation occurred? Usually smaller hole round core sections are subsamples inside an anaerobic camber (glove box) or subsamples are taken with cut-off syringes via small holes cut in the side of a liner or alternative from fresh cuts during sectioning. Al halve split exposes large areas to air even though somehow a N2 shower was installed this sees quite unusual. Was this split done at the entire 3 m core? How was a N2 shower over the 3-m length maintained during the sampling of the 10 – 20 subsamples from each core?

What are the “adequate measures” to avoid contamination? Does this refer only to the use of sterile spatulas? Were the sample bottles autoclaved?

Line 92: fractions means subsamples ?

Line 93: “, while one fraction, each for chemistry . . .” you mean two subsamples, one for chemistry and one for microbiology?

Line 99: ion chromatography

Line 101: what is the number in brackets? A catalog number? (should be removed).

Line 106: “passed through . . .membranes” – the samples were probably “filtered” – with syringe filters?

Line 108: Please more details on the method calibration: What standards were used for calibration, what calibration, how many points? External? What does “sample reproducibility,” mean analytical precision? How was this determined, by how many replicate measurements of the same sample? The value should be given in molar

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concentration if for a specific sample or in RSD (%) if it refers to the precision of the method itself.

Line 129 ff: for the determination of AVS and CRS fractions, original literature should be cited. How was Ag2S quantified, gravimetrically?

Line 261: 0% partial pressure? Pressure unit is not percent. Also 0 probably means anoxic?

Line 268ff: This is the standard cline protocol, which is widely used and generally accepted - not necessary to describe the principle.

Line 286: what does serially diluted mean?

Line 288: here and elsewhere, please use until instead of till. As this is a scientific article, and till is considered to be informal which should be avoided.

Line 289: “pure-plates” ?

Results and discussion

Line 327 “relevant (microorganisms)“ ?

Line 329-334: Very long sentence- almost not understandable: consider splitting and rewriting.

Line 334 “were found to contain” – shorter “contained”

Line 341: Unpublished data should not be cited if not necessary. Here are 5 other references given. The reference to unpublished data is unnecessary.

Line 391-395: Long and unclear sentence.

Line 406 – 411: Long and unclear sentence.

Line 423: The discussion refers here to another unpublished paper. The suggestion/discussion here is based on unpublished data from the authors. Such data should

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either be included in this manuscript or published first. Alternatively, the results should be discussed in the light of other already published studies. Otherwise, this discussion is not solid.

Lines 425 ff. The results of the incubation appear very unsystematic or random. A figure could help for an overview. The writing is also not precise, i.e. the “samples” do not convert thiosulfate to tetrathionate . . . conversion was observed in the samples or the organisms in the sample convert the species. . .

Line 430ff: “In contrast, . . .” The sentence is very long. Also, there is no “contrast” obvious. “free and detectable” is unnecessary.

Lines 434ff: the samples do not metabolize. Organisms have a metabolism but not a sediment samples.

In this entire section is not clear how the rates were determined. A figure might help.

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