

Interactive comment on “Endolithic Boring Enhance the Deep-sea Carbonate Lithification on the Southwest Indian Ridge” by Hengchao Xu et al.

Anonymous Referee #1

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General comments:

authors: Xu et al.

This manuscript evaluates the impact of macrofaunal activity on the lithification of deep-sea carbonates. This appears to be an interesting and previously not very thoroughly explored topic, and has the potential to advance our understanding of both the impact of bioturbation, as well as the controls on carbonate lithification. I especially appreciate the fact that this paper is very to the point, and not overly extended (although it does require some in depth discussion on some points, see below). One immediate problem with the manuscript in its current form is the sometimes confusing writing

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style. Additionally, most of the discussion rests on speculation, rather than data, which undermines the value of this manuscript. I believe the authors should expand their observations, and especially include a thorough, quantitative assessment to elucidate the relative importance of bioturbation for carbon lithification.

Major specific comments:

- Language: While this is not the case for the manuscript as a whole, there are a lot of parts which suffer from bad spelling and grammar (see the technical corrections for specific examples, that list is not exhaustive). Before this manuscript can be accepted, it should be thoroughly revised for language.

- Interpretation of the figures: I have some difficulties with following the interpretation of the images presented in Fig. 2 and 3. On P7L6-7 you state that it is difficult to know the real depth of each burrow. How exactly do you then go from the pictures in Fig.2a-d to the burrow shapes in Fig. 2e? How do you know they are J-shaped, and not just U-shaped, but broken off? Did you do this by eye, or did you use a cast, or scanning techniques? Please expand The same remark for Fig. 3, you state (P5L22-23) that ‘the most readily observable feature is the localized enhancement of density around the boring’. I have looked at the images, and even with the arrows, I have a lot of difficulties finding these enhancements. Since most of your discussion rests on these observations, I think you should expand and more clearly explain on what this statement is based. You might want to consider playing with the contrast, or other visual techniques, to make these features more clear (cause now I cannot see them). Additionally, you need to expand on the statistics used to generate the linear correlations in Fig. 5.

- Discussion: I believe the biggest problem with this manuscript is the lack of data, and a quantitative discussion. I am supportive of the authors efforts, and I do believe that bioturbation could play a role in carbonate lithification. However, to make this case based on a few images, without any quantitative discussion, seems a bit of a short-

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cut. The authors should expand on these observations, and give a better mechanistic explanation on how bioturbation would enhance lithification, and include a thorough quantitative assessment of the relative importance of this process.

Minor specific comments:

- The authors use 'boring' throughout the manuscript when they discuss the burrowing of macrofaunal organisms. This is rather confusing, as in my experience, it is more common to use 'burrowing' and 'burrow(s)'. I would suggest to change this throughout the manuscript to improve readability
- Additionally, I had to google the word 'endolith'. While it is correctly used, I again would suggest to avoid the use of this word, and use the more common 'macrofaunal', 'benthic fauna' or others, to improve readability.
- Results: at the start of the results (P5L3) it is immediately stated that the macrofaunal burrows were lined with ferromanganese crusts. While this assumption is used aplenty throughout the manuscript (see for example Fig. 7), you do not provide evidence that these are indeed ferromanganese crusts. Please justify this assumption (or say it is just an assumption, but then explain why).
- P6L21-25: a lot of discussion about Sr, but it is not shown?
- Table 1 is too long to be readable. I would suggest to make this a supplementary table, and take out the most important trends and plot those in a figure.
- P6L33: how exactly does bioleaching deplete the isotopic value? P7L15-16: why do these carbonate deposits form a favourable environment? What is special about them?
- P7L5-11: I cannot follow the reasoning behind this estimation. You cannot find the real depth of the burrows, but assume 6 cm, with is the median value. How do you get a median value if you cannot determine the real burrow depth? How do you get to 12 holes per 1dm² surface? Should you not compare volume to volume? Please be more explicit.

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Technical corrections:

- P1L11: 'macrofaunal inhabitants' -> not correct, better: 'benthic macrofauna'
- P1L15-16: 'Our study reports an unfamiliar phenomenon . . . and interested by the . . .'
-> this sentence is very vague, and also wrong (what is interested?), please rephrase
- P1L16-17: 'These carbonate rocks may . . .'
-> it is not the carbonate rocks that provide a mechanism, please rephrase. . .
- P1L29: 'remains' -> remain
- P2L10: 'Burrowing and boring' -> I believe these are synonyms 'because it enhances'
-> because they enhance
- P2L13: 'organismic burrowing and boring' -> same remark as above, and organismic can be removed
- P21L21: 'between the bioturbation' -> 'between bioturbation'
- P2L30: 'it has been well proved' -> it has been well proven 'bursting' -> what does this sentence mean? Biogenic bloom was bursting?
- P2L32-P3L2: I understand the sentence, but he is not constructed correctly . . .
- P5L9: 'herald' -> indicate
- P5L10-11. What does this sentence mean?
- P5L14-16: the message you are trying to convey is unclear, please rephrase
- P5L31 'quart' -> quartz?
- P6L13-15: sentence does not make much sense
- P6L17: 'dipartite evolutionary of diagenesis' -> what does this mean?
- P6L21-25: 'character' -> characteristic, 'is highly variable of Sr' -> is the highly variable

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Sr, 'different portion of' -> different portions of, 'mainly accounted for the substitution' -> mainly caused by substitution 'recrystallization, resulting in' -> recrystallization results in 'The loss of' -> the decrease of 'could also a response' -> could also be a response

- P6L31: statement needs a reference ('typical values for biogenic carbonates')
- P7L12 'several boring purposes are served for the benthic animals' -> does not make any sense, benthic fauna form burrows for certain purposes.
- P8L1-2: 'Alternatively, bacteria and organic detritus are considered to the major source of benthic fauna in deep-sea' -> this sentence means that benthic fauna originates from bacteria and organic detritus. While this is possibly true from an evolutionary perspective, I do not think this is what you want to say here . . .

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