

Line-by-line comments:

Words in **bold** show the suggested insertions/deletions/corrections.

21- ... the Foraminifera **themselves secrete** the opal layer. The **opal** layer...

22- ...growth pattern **to** the...

33- Please rephrase this sentence as quartz is the most common silicate mineral and therefore it reads a bit funny.

34- Biologically assimilable sounds clunky, consider using **biologically available** or **bioavailable**.

36- replace both instances of or with **and**

37- remove **their**

38- remove **The** and **were proposed to**

43- ...of a shell, **also called a “test”**, which...

43- I recommend combining these two sentences, for example like this ...or **consist** of precipitated minerals, **most commonly calcium carbonate** (CaCO₃) (ref).

48- tests

49-50- I suggest turning this phrase around to make it easier to read... carbon cycle through carbonate production (ref) and remineralisation, especially in poorly oxygenated environments (ref).

51- Although **the** exact calcification process is still **up for debate**...

55- ...in **the** late..., tests

56- ...of **the** North... replace was with **were**

59- replace having with **with**

60- particles

62- depths

63- replace because with **as**

64- ...being the only **representative of the** newly...

66- ...the test together, such as...

77- ...but were **inferred to be of** sedimentary...

78- replace have with **has**

79- replace or with **and**, ---having a **siliceous test have been** reported....

83- there are various instances of the use of “**the**” before Sagami Bay. Please remove all of these. It should read... 1410m depth in Sagami Bay (Japan).

84- replace from with **for**

88- remove **further**

89- ...using **Foraminifera test** composition...

98- Figure 1: Map of...

99- Table 1 **summarises** the sample’s origin...

100- intervals, **techniques**

102- ...type of **analysis**...

105- live checks sounds clunky, please rephrase.

109- ...observations **were**...

112- replace water ice with **ice crystals**

113- to avoid confusion, ... a high-resolution SEM image for **each individual**...

114- ...possible **overlap** of EDS peaks **from** the coating metals.

117- replace were with **was**

118- ...the main **component of calcitic tests**... Suggest changing sentence to: Scaling and/or rotation of EDS maps were performed...

119- replace mapping with **map**, and from with **of**
120- ... origin, **the** aluminium..., replace to with **from**, ... (typically clay minerals, the major constituent of sediment at the sampling site)

128- **Subsequently**, ...

130- In addition, **optical images**...

131- ...after **the** decalcification...

133- ...the **contents of the cytoplasm** using...

135- please rephrase this sentence as live checked is clunky. A suggestion could be, Directly on board, living specimens (n = 8) were isolated from different...

145- SEM or STEM?, ... mode **operating** at an acceleration...

148- remove **size**

152- ... prior **to** measurement

153- ... microscope **Fourier transform** infrared spectrometer...

155- Remove Because

155- CaF₂ absorbs below 1000 cm⁻¹, **therefore** no band assignments **were** done...

159- ... apertural side, **a** few chambers...

160- ... prior **to analysis**.

172- ... imaged with low-vacuum...

175- ... the **final (newer)** chambers...

170-175- I suggest re-labelling Figure 2 such that the text then references the figures in order. For example this would then read as: Macrospheric (haploidic) and microspheric (diploidic) specimens were observed with a stereomicroscope (Fig. 2a & 2b) before being imaged in low-vacuum SEM settings (Fig. 2c & 2d). The figure caption for Figure 2 could potentially be re-written as: Macrospheric (**top row**) and microspheric (**bottom row**) Bolivina spissa specimens, imaged with a stereomicroscope (**a and b**) and low-vacuum SEM before (**c and d**) and after (**e and f**) decalcification to expose the Si layer below the calcitic shell.

180- connexions replaced with **connections**.

180- The initial reference to Figure 3a can be expanded to make it clear to the reader that the smooth walls visible in the image are in fact the Si layer, before discussion of the funnel-like structures most likely composed of organic material. A label should also be added to Figure 3a to make this immediately visually clear to the reader that these structures are the Si layer.

180- **Protruding** funnel-line structures were **visible** at the pores' locations...

181- Suggest rewriting this sentence as: These funnel-like structures were not made of Si but were probable remains of organic material, as cryo-SEM (ref) and TEM observations (ref) show the Si internal coating terminates at the pore plate.

188- connexions replaced with **connections**.

191- Figure 4 illustrates the **workflow used** to obtain...

192- ... maps **of** non-sedimentary origin which **were**...

193- The calcium distribution (**Fig. 4a, b**) was correlated to areas of lower electron-density on the SEM images (**Fig. 4c, d**), representing the calcitic tests of individuals.

194- Sedimentary aluminosilicates **were** removed by subtracting **the** aluminium signal...

195- decide whether to use silicon or Si and use throughout.

196- replace from with **of**

197- ... the **Si** signal...

200- **The** proloculus...

204- the Al signal **from the** Si signal (i.e., removing aluminosilicates)

204- Replace from with **of**

206- chambers

207- **the** proloculus **to** apertural side

207- suggest changing this sentence to... was correlated to cryo-SEM observations showing decreasing Si layer thickness towards younger chambers.

209- fractures, remove **nature**

210- ...structures **were** observed between the Si layer **and** the calcitic shell...

211- In very rare cases, we observed a **gap** between the two layers, such as **in** Fig. 5e, which we ascribe to preparation artifacts (i.e. **the** cutting step).

213- ...of **a** representative...

215- Magnified...

216- the **a** with **the**

216- ...typical **of** glassy materials.

217- ...the **gap** between...**results** from **a preparation artifact**.

218- **The** thickness...

221- replacer newer with **younger**

222- replace while with **when**, replace over with **of the**

223- replace definition with **resolution**

228- replace minute with **small**

232- replace are with **is**, remove **the**

233- The broad bands at ~3400 cm⁻¹ and ~1635 cm⁻¹... please add a reference here if possible

234- ...a broader band **at 1070 cm⁻¹** with a shoulder...

236- **Representative** FTIR spectra...

243- suggest rewriting as: ultra-thin sections of *B. spissa* individuals were imaged with TEM.

244- Suggest rewriting this sentence as: From a total of eight individuals imaged, two showed structures filled with matter showing the characteristic conchoidal fracture pattern of silicon-based materials.

245- Suggest rewriting as: This conchoidal fracture pattern, visible after sectioning with a diamond knife, was similar to the conchoidal fractures visible within the Si layer coating the inside of the calcitic shell of all eight specimens.

253- replace resembling with **similar to**

255-...detritus, **occur abundantly** in...

258-...for **the** proloculus side...for **the** apertural...

259- values **ranging from** +0.13...

260- ...which **ranged** from...

260-...of **the** aperture side **were** comparable **to the** isotopic equilibrium value of calcite at **a** depth of...

262- replace represent with **showed**

268- Decide whether to use Si layer or silicon-rich layer and use consistently throughout

269- on cryo-SEM and TEM images, no brackets. Replace from with **of**

270 replace from with for, silicon-using with silicon-**based**

271-...which **were in good agreement with spectra of** reference opal

275- *B. spissa* **appears homogenous**, without...

276- Please provide a figure reference here. The sentence on *M. legis* a bit too long and therefore reads poorly, consider breaking up into two sentences.

280-...genera, **as is the case for the carbonate** tests of Miliolida and Rotaliida...

284- ... **analogous** to the calcitic tests in...

287- replace could observe with observed a

289- replace is resulting with **results**

289- ...trend, **similar** in ...

290- of **an** opal coating

291- ...steps, **comparable to...**

292-... thickness is **at a** maximum... Please add a figure reference.

293- replace few last with **youngest**

295- Figure reference

296- **an** opal layer, replace afterward with **after**

298- I suggest changing the title of section 4.2 to: Is **the opal** layer precipitated by the foraminifera itself?

302-...and hence exposed...

306- replace showing with **demonstrating** and when with **while**

307- ...site, such as...

310- replace from with **of**

310- suggesting change to: (e.g., of sedimentary or biogenic origin, i.e., secreted by another organism and subsequently incorporated by the foraminifer)

313- patterns

315- I suggest that the sentence is reorganised to remove the brackets and that the figure references are placed after the corresponding text.

318- replace resembling with **similar to**

318-...opal in **the frustules of diatoms** (ref)

319- What do you mean with 'shell building'? Please clarify.

324- have never before been reported

325- ...**SDV**-like organelles in two **out of** eight...

326- **SDV**-like (no s in this case)

327....both in younger and older chambers of the same specimen (Fig. 8), suggesting that opal layer...

334- ...**reported on in the literature**.

342- Please clarify what you mean with 'nesting Rotaliida and Miliolida in naked foraminifers'

343- Similarly, **it has been previously** suggested that

349- Please clarify what you mean with 'in most of other Foraminifera represents'.

349- It is the first time SIT as an acronym is used and should therefore be written out... ancestor **have previously been** identified...

356- If you use 'was proposed' then please add references at the end. I'd recommend changing this to: Foraminifera tests serve various functions...

361- replace in with **to**

364- signs

367- Please remove the word **reportedly**, it makes it sound like there is an element of doubt about these claims of mechanical strength etc.

367- I recommend rewriting this sentence as a light weight and strength do not lead to structural integrity, which is a different property altogether. I suggest: ...are known to possess remarkable mechanical properties such as light weight, strength and structural integrity, among other functions

369- **Despite not observing** any... Remove capitalization of Diatoms and use **diatom frustules** instead.

371- I think this sentence should be turned around or else ended differently as currently it sounds as if the authors are putting forward a theory that they already have identified some potential arguments against but are nevertheless advocating for until proven otherwise.

383-...calcify **at higher temperatures** compared...

384- remove **it**

388- ... 5 times **more resistant** to abrasion...

389- Foraminiferivory is quite a niche term not found in many recent publications. I suggest replacing it with predation.

390- ...reported to drill holes into the shells of bivalves by...

391- tests

393- remove **a**

396- replace protection with **protective**

397....preventing predators **from accessing** cell contents... in Sagami Bay are potential prey

400- remove **it was suggested that**

405- replace sometimes with **occasionally** and remove **such**

410-... be **for protection against** predators...

413- ...other, potentially non-exclusive, functions.

415- B. spissa, where C and O isotopic compositions were close...

417- **overwritten**

421- ...temperatures during **the**...

423-... suggested that variations **in** intracellular...

428- purposes

429-...B. spissa **has been** used...

430- replace done with **performed**

431- ...shells as a geochemical proxy.

444- It is not immediately clear what is meant with 'for global nitrogen cycle'. Please clarify and rephrase.

449- ...cycles, **the** biological carbon pump, **and** marine food...

456- replace afterward with **after**, remove phases, and replace presume with **propose**

458- tests

458- However, other (non-exclusive) functions could exist and need to be investigated further.

459- Suggest rewriting this sentence as The presence of this until now overlooked opal layer below the calcitic test of the cosmopolitan B. spissa raises questions on the extent of silification in Foraminifera.

460- This sentence is a bit long and could be split into two.

463- ...below **the calcitic test**...