SOIL Discuss., referee comment RC1
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Comment on soil-2021-141

Anonymous Referee #1

Referee comment on "Biocrust-linked changes in soil aggregate stability along a climatic gradient in the Chilean Coastal Range" by Nicolás Riveras-Muñoz et al., SOIL Discuss., https://doi.org/10.5194/soil-2021-141-RC1, 2022

The study by Riveras-Muñoz et al. describes dry and wet aggregate stability along a climatic gradient in Chile and evaluates the effect of biocrusts on this stability. Dealing with these two factors, climatic gradient and biocrusts, the paper is multidisciplinary and should be of broad international interest.

However, I have some comments that I would like the authors to consider when revising their manuscript. These are:

General comments

- Given that in the present study aggregate stability was analyzed and discussed with regard to (i) the effect of climate and further (ii) the biological influence, all sections including the introduction and abstract as well as hypotheses should not start with BSC but should follow this order: aggregate stability in general, effects of climate, effects of BSC.
- Also, a strict order within sentences or paragraphs will improve readability of the text. This applies for the order of factors (climate/BSC), treatments (BSC-, BSC+) and sites (north to south).
- Some sentences are very complicated in structure and content. Hence, I suggest to split these sentences for better reading and understanding.

Specific comments

Line 31 and 271: what are “edge aggregate size classes”? please explain

Line 55 ff: please, consider the fact that the occurrence of lichens is not restricted to more humid locations but that many lichens were also found in PA (e.g., Jung et al. 2019: DOI: 10.1111/gbi.12368; Jung et al., 2020: doi.org/10.1016/j.isci.2020.101647)

Line 59: please consider: available water for lichen growth can also mainly be provided by fog and dew (e.g., Jung et al, 2019: DOI: 10.1002/mbo3.894)

Line 67: please explain: what do you mean by “small scale”? Elbert et al. 2012 (DOI: 10.1038/NGEO1486) pointed out that globally cryptogamic covers take up 3.9 Pg C per year.

Line 89: do you mean “soil structure-forming processes DUE TO biocrusts”?

Line 94: not only cyanobacteria but also green-algae are well known to produce extrapolymeric substances which can glue soil particles together (e.g. Lewin 1956: doi.org/10.1139/m56-079); please add

Line 98: what do you mean by “which physically traps aggregates and soil particles“? Please explain

Line 99: please clarify: because of what are soil aggregate stabilization processes dynamic and occur on different time and space scales?

Line 107: what do you mean by “external soil factors”, please explain

Line 108: why only “in the short term”? please explain

line 133: what do you mean by “on the soil surface”? please specify

line 136: do not confine any of this hypothesis but discuss later in the discussion

line 169: it does not become clear how biocrusts were collected exactly – please explain;

please show pictures of the biocrusts sampled at each site (plot picture)

line 177: for the time being: please refer to other researcher's work on algae and cyanobacteria in BSCs of these locations (e.g., Baumann et al., 2018: doi.org/10.1016/j.soilbio.2018.09.035; Samolov et al., 2020: doi:10.3390/microorganisms8071047)

line 183: please describe exactly how and up to which depth biocrusts were removed (e.g., were the rhizoids of the mosses cut at the soil surface?); what did the BSC look like in PA and what exactly was sampled?

Line 190: Total C and N of what were analyzed? Please describe more precisely

Line 195ff: please explain: what do you mean by "…and corrected by coarse fragments content"?

Line 197 f: insert "difference" before "mean" and "geometric"; please spent some more sentences to explain what results of these indices will mean

Line 204: insert "fraction" after "2-30 mm aggregate"

Line 205: insert "differences" before "geometric"

Line 206: explain what "exp" means

Line 209 and 212: insert abbreviation in brackets

Line 214f: is "weight" correct or should it be "mass"?

Line 253f: start paragraph with "Dry sieving showed….."

Tables: please insert in the captions that significant factors for response variables are given in the appendix

Fig 1: improve Fig. by noting BSC+ and BSC- also on left hand site of Fig.

Line 319-328: These paragraphs are repetitive and should be removed from here

Line 340: what is does mean: "with a more stable condition"? please explain

Line 341: which "different category"? please explain

Line 370 f: what do you mean by this sentence? Please reword

Line 375 f: "In this sense…..": the deduction of this idea is not clear, please explain

Line 403: what do you mean by "an indicator of values outside the study range"?, please explain

Line 404 f: split this sentence into two

Line 416 f: for this statement it is very important to know how biocrusts looked like and were sampled and what exactly was included for bulk density, especially for samples in PA; please see grit porosity as outlined in Jung et al. 2019 and 2020

Line 426: what do you mean by "no differences is made between…."? Please explain

Line 429: bryophytes have no hyphae but rhizoids – please add

Line 437: please repeat text of hypothesis

Line 442 ff: please split sentence

Line 444 ff: please reword sentence and repeat hypotheses

Line 449: what other factors do you mean? Please speculate

Line 454: please repeat text of hypothesis

Line 455: please reword the sentence to show its importance

Technical corrections

Line 116: close bracket before “with”

Line 186: please insert name of reference

Line 198: use lower case g for “geometric”

Line 359: insert “a” before “property”

Line 378 f and 421 f: do not spell out total carbon and nitrogen again but use abbreviations

Line 390: insert “out” after “points”

Line 452: replace “,” by “and” before “sand”