

SOIL Discuss., referee comment RC2
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Comment on soil-2021-141

Anonymous Referee #2

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-RC2>, 2022

The importance of biocrust on soil aggregate stability is underexplored. The research covers a large climate gradient transect of ecological relevance.

There are some issues with the paper which warrant comments or improvements from the full author team. The fact that only Ct is measured is somewhat of a mistake. It is clear that in the southern site NA most of C will be organic C and in PA it will be inorganic C (carbonate) which will have differing effects on the aggregate structure, stability and formation. The other issue is whether or not we are observing the effect of pure lichen biocrust (PA) versus a moss-containing or dominating biocrust (SG, LC and NA) on aggregates. It is not 100% clear from the paper what the relevance is of the selected aggregate size, it feels somewhat random. Are all these macro-aggregates? If so, this should be stated. It is concerning that the aggregate sizes which show increased stability are the largest and smallest size bins selected, a leftover effect? Also, to some extent visible in Fig 1 where 30 mm and 2.0 mm size fractions look completely different from all others, even without considering the biocrust effect.

The paper describes in minute detail differences between fractions and sometimes loses the bigger picture. The visualisation of the data is minimal, most data is tabulated. With only one figure. In all tables and the figure it is not clear what differences are actually significant in the four sites between treatment (biocrust) and for the various size fractions. Errors on the means (standard deviation or standard error?) are generally larger, making it even more difficult to see what is of real significance and what is not. The lack of visualisation makes the paper unappealing for the reader to look at.

The conclusion reads extremely long for a full page. Most is (semi)-discussion and should go there.

I think it good to go back to some of the original work relevant to this study but this leads to reference of papers from 1950, 1929 and ultimately 1883. This is not fully balanced by lots of recent papers on the topic last 5 years.

Overall the paper has not fully reached its potential, the paper can be streamlined by focus on the key issues and significant findings rather than spending a lot of time and effort on detailed differences which are not necessarily always significant I guess.

Appendix A already give a good guidance what is of interest. Basically the 4 sites are nearly always significantly different for each parameter, not surprising based on the selecting of the sites with this large climate gradient. Biocrust has no effect on coarser fractions (e.g. sand), C and C/N which could be organic C vs inorganic C reflection between sites. Largest and smallest aggregate size fraction, and $R < 2$. What maybe worthwhile is to look at the site * biocrust interaction what it tells about the aggregate stability /biocrust issue