

## Answers to review comments one – RC2

### Pan et al., "Biotic factors dominantly determine soil inorganic carbon stock across Tibetan alpine grasslands" (egusphere-2022-562)

#### Reviewers' comments:

##### Referee 2:

Comments to the Author

Pan and co-authors studied how much inorganic carbon (SIC) is stored in soils throughout the Tibetan plateau along with biotic and abiotic parameters. In their main conclusion, they report that biotic parameters exert greater control over SIC stocks than abiotic parameters, and that the significance of abiotic parameters is higher in the subsoil than in the topsoil.

**Response:** We thank the reviewer very much for summarizing our study and providing all the intellectual comments to further improve the manuscript.

The topic of this study – soil inorganic carbon stocks and their controls - is a timely and important, and the authors have collected an impressive dataset of biotic and abiotic measures. Their methods are state of the art and well described (although more details on plant parameter measurements are needed), and overall the manuscript is clearly written.

**Response:** We sincerely appreciate the reviewer for the positive comments and valuable suggestions to help us improve the manuscript. We have added the information on plant parameter measurements in the part of Material and Methods (Lines 158-162)

Unfortunately, I do not think that the second research question (contributions of different controlling factors to SIC stocks), on which the majority of the manuscript focuses, cannot be answered with the chosen experimental design, as correlation cannot prove causality. With this design, the authors can only show association of SIC stocks with external factors. In the most cases, it is not clear if e.g. FA, BA etc. influence SIC,

if SIC influences FA, BA, etc, or if both variables are independently influenced by an underlying third parameter.

In my opinion, this issue could be solved by rewriting large sections of the manuscript, removing wording like 'X has an effect on SIC', discussing potential controls in both directions as well as potential underlying third variables, and very, very carefully assessing if the partitioning into biotic and abiotic factors is still possible.

**Response:** We sincerely appreciate the helpful suggestions. And we agree with the comments that 'correlation cannot prove causation'. Following the intellectual comments, we have rewritten large sections of the manuscript and deleted some descriptions that are inappropriate. Specifically, we have removed the interpretation that overuses correlation as causative mechanism and deleted some descriptions (e.g., X has an effect on SIC, Lines 202, 212, 214, 220, 258, 263, 269-270, 296-298, 354, 364, 375, 387, 390, 400, 402-403, 409, 412 and 415) that are inappropriate and overusing correlation. Instead, we have also broadened the discussion of mechanisms underpinning our results by considering potential third variables as follows: "Although most of the variations in SIC density were explained by our measured explanatory variables, some other potential variables may also predict SIC density (Fig. 5). Then, understanding the effects of other potential abiotic and biotic factors on SIC density with soil depth is urgently needed when predicting the response and feedback of SIC to climate change in the future." (Lines 394-399)

One avenue for improving this manuscript would be to re-focusing it towards which parameters can be used to predict SIC content (rather than which parameters control SIC), which could be useful for mapping/upscaling of SIC stocks.

**Response:** We sincerely appreciate the reviewer for the constructive comments and helpful suggestions. We have carefully studied these useful comments and revised the manuscript accordingly. Specifically, we deleted the word "controlling" (Lines 202), or revised "controlling" into "predictor" (Lines 214 and 264). Also, we have revised some inaccurately expressions like 'X has an effect on SIC' into 'X parameter can be

used to predict SIC content' in the revised manuscript (Lines 202, 212, 214, 220, 258, 263, 269-270, 296-298, 354, 364, 375, 387, 390, 400, 402-403, 409, 412 and 415).

**Thank you very much for your consideration.**

**Kind regards,**

**(Junxiao Pan and Jinsong Wang)**