Response to RC2

1. In the manuscript, 'Soil and plant $\delta^{15}N$ have a different response to experimental warming: A global meta-analysis', the authors assess 20 experimental warming field studies and conclude that soil and plant δ15N had negative and positive responses to warming at the global scale, respectively. Overall, the study is a nice contribution because it looks at both plants and soils. But I think the title oversells and misleads. Also, I realize that this is a short communication, but more detail is needed to support the hypothesis, to rationalize why the specific environmental variables were chosen over others, and to relate this study to other results in the literature.

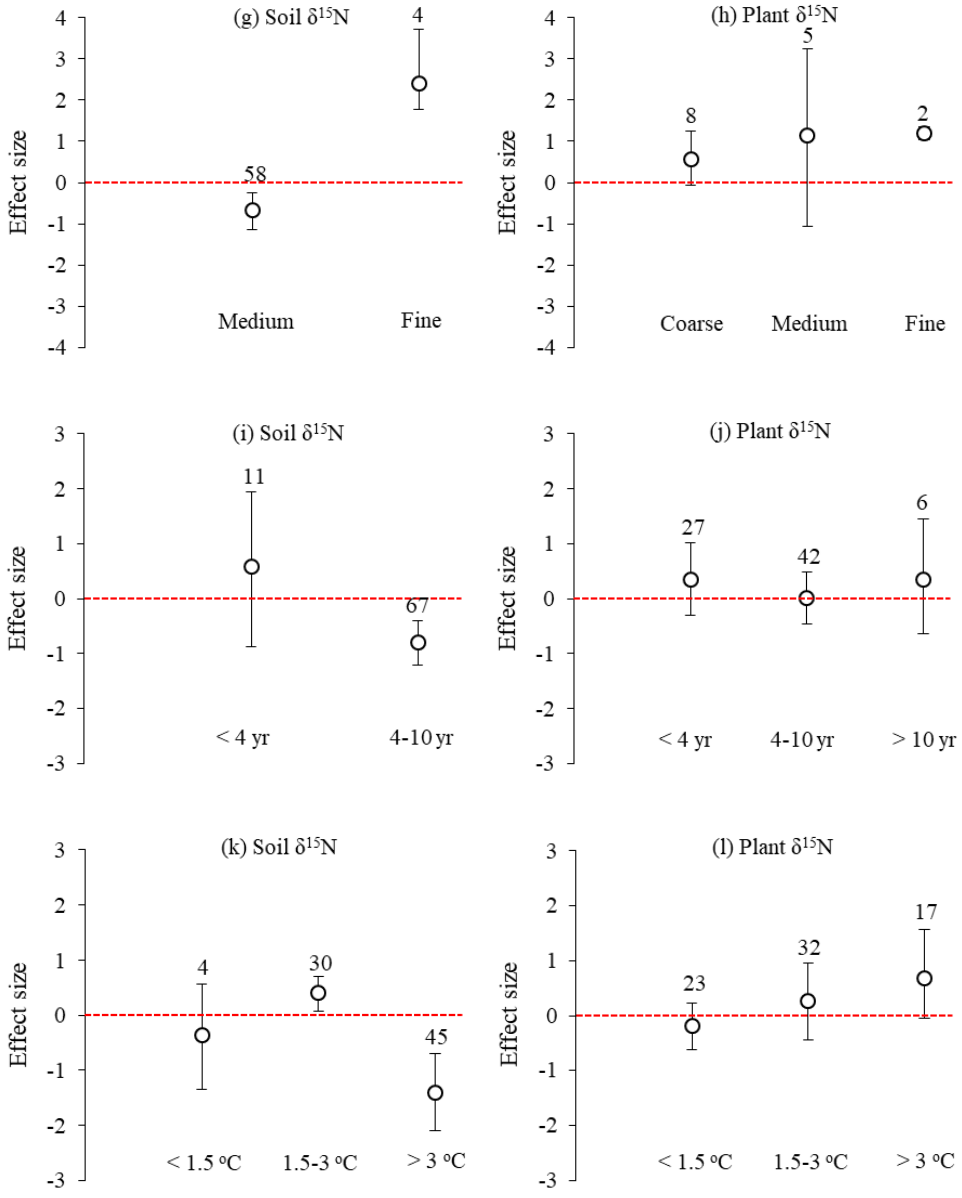
The word 'significantly' is overused in the abstract, and the presentation of results that are not significant as effects is not appropriate. It would be better to not use the word significantly and to only present the significant results (after defining p-value cut-off in methods). In other words, remove the inference from the title and abstract that plant δ15N had a positive response to warming – this was not significant. I think the finding that soil δ15N is a better indicator than plants of environmental cues is a more appropriate conclusion or story lead. Because really, the pattern of response of plants and soils to environmental drivers tested here was not different, it was just weaker in plants than soil.

Answer: Thank you very much for your efforts on our paper submitted to the "Soil" (Manuscript ID soil-2021-40). We have checked the manuscript and revised it according to the comments carefully.

In the revised manuscript, the title has been changed to "Soil $\delta^{15}N$ is a better indicator of ecosystem nitrogen cycling than plant $\delta^{15}N$: A global meta-analysis". In addition, we also re-conducted the meta-analysis to investigate the influences of soil texture, warming period and increase in temperature on the warming effects on soil and plant $\delta^{15}N$. From Fig. 2gh, the finer the soil texture, the more significant the positive effect of warming on soil and plant $\delta^{15}N$. The possible reason is that the finer the soil texture, the stronger the adsorption of various ions on the soil and the smaller the leaching loss of the soil, resulting in the greater the residual amount of ^{15}N in the

soil (Webster et al., 1986). In addition, the longer warming period and the greater increase in temperature resulted in the more negative effect of warming on soil $\delta^{15}N$ (Fig. 2ik). Chang et al. (2017) deduced that N fixation was greater under warming and consequently resulted in a lower soil $\delta^{15}N$ (P10L189-196).

Figure 2:



Finally, we have removed the inference from the title and abstract that plant $\delta^{15}N$ had a positive response to warming – this was not significant. Similar modifications have been made elsewhere in the paper (P2L19-20). We have indicated that a

significant decreasing trend in soil $\delta^{15}N$ and no significant trend in plant $\delta^{15}N$ were found in this study (P8L163-164).

2. l. 44. Please explicitly define ‘openness’ in the introduction (and if possible, in the abstract). Although some readers will understand, those unfamiliar with the δ15N literature will read this as jargon.

Answer: In the Introduction section of the revised paper, we have explained that openness is a measure of both N inputs and outputs relative to internal cycling and determines both the potential rate of N accumulation in the ecosystem and the potential for N losses following a disturbance (Rastetter et al., 2021) (P3L49-52). However, we did not define “openness” in the abstract due to space limitations.

3. l. 50-51. This should be reversed: The isotopic fractionation effect results in gradual 15N enrichment.

Answer: Sorry for this confusion. In the revised paper, we have indicated that the isotopic fractionation effect results in gradual ^{15}N enrichment in the ecosystem (P4L56-57).

4. l. 74-75. The hypothesis is not supported by any rationale in the introduction, please provide some preamble that supports why they should be different.

Answer: Sorry for this confusion. In the revised paper, we hypothesized that soil $\delta^{15}N$ is a better indicator of ecosystem N cycling than plant $\delta^{15}N$ (P5L81-82).

5. l. 85-86. It is not clear why temperature gradient studies are being excluded, as they will also include a treatment and control. Perhaps the authors could clarify - do they mean climate gradients (space-time substitution), or lab incubations?

Answer: Sorry for this confusion. In the revised paper, “temperature gradient” has been replaced by “climate gradients (space-time substitution)” (P5L92-93).

6. l. 114. I am quite surprised that length of warming was not considered, as multiple studies illustrate different responses in plant and soil CNP for short and long-term warming experiments. Also, see Craine et al (2015), which suggests that soil δ15N is directly controlled by soil C and texture, and only indirectly controlled by temperature. Did you consider length of warming, SOC, or soil texture as sub-groups? I see l. 47-67 in the intro provides justification for the subgroups, but I remain unconvinced that the chosen subgroups are more important than the ones not assessed. Perhaps this needs better support from the literature.

Answer: In the revised manuscript, we re-conducted the meta-analysis to investigate the influences of soil texture, warming period and increase in temperature on the warming effects on soil and plant $\delta^{15}N$. From Fig. 2gh, the finer the soil texture, the more significant the positive effect of warming on soil and plant $\delta^{15}N$. The possible reason is that the finer the soil texture, the stronger the adsorption of various ions on the soil and the smaller the leaching loss of the soil, resulting in the greater the residual amount of ^{15}N in the soil (Webster et al., 1986). In addition, the longer warming period and the greater increase in temperature resulted in the more negative effect of warming on soil $\delta^{15}N$ (Fig. 2ik). Chang et al. (2017) deduced that N fixation was greater under warming and consequently resulted in a lower soil $\delta^{15}N$ (P10L189-196).

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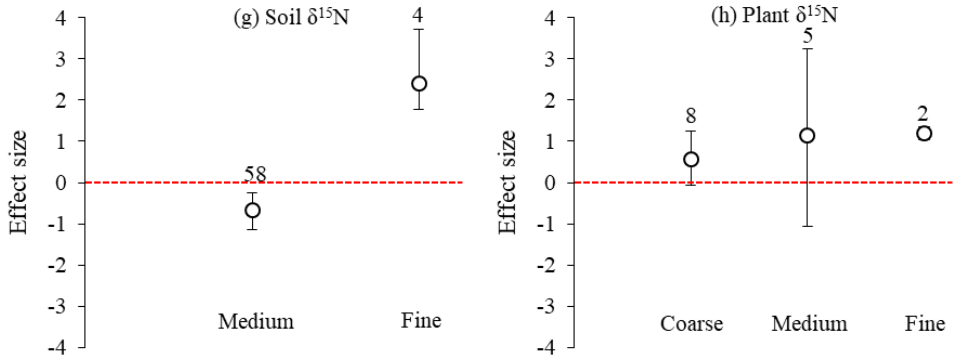

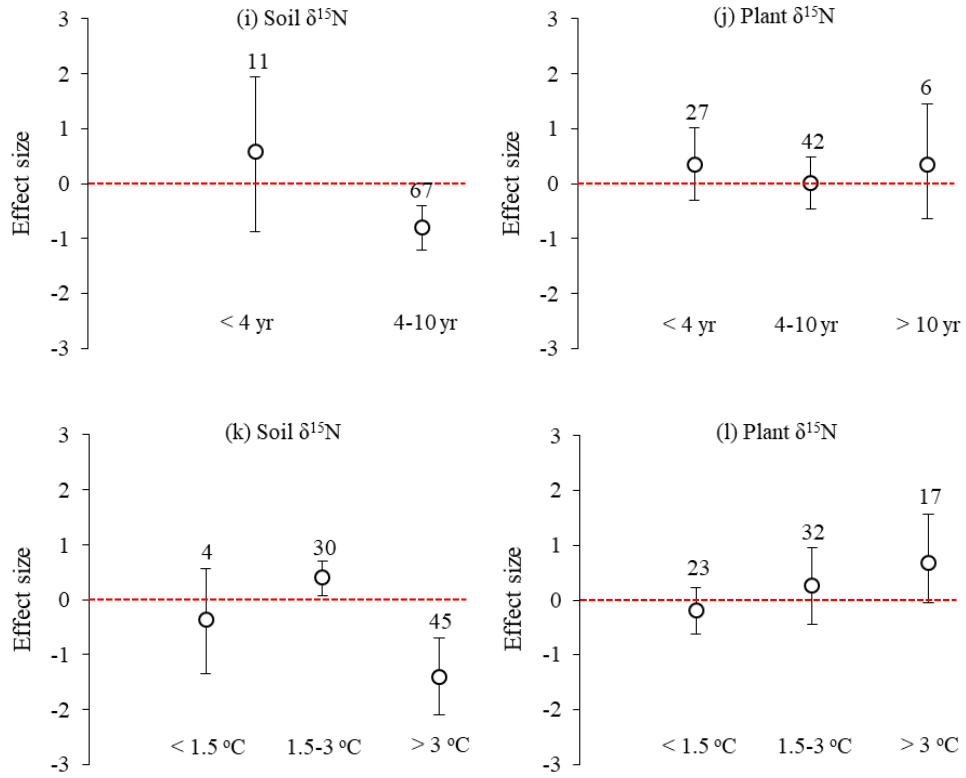

However, we did not consider the effect of soil organic matter content since only four literatures provided the organic matter content values.

7. l. 176. Actively layer > active layer

Answer: In the revised paper, "actively layer" has been replaced by "active layer" (P9L187).

8. l. 177. This is not true for all air warming treatments.

Answer: Yes. I agree with your comment. In the revised paper, we have indicated that air warming directly impacts aboveground temperatures and has an indirectly effect on soil $\delta^{15}N$ (Pardo et al., 2006) (P9L187-189).

9. Table 1 should have a column for soil types – at the very least, organic or mineral soil, but especially pH, since this was a main factor in the analysis.

Answer: In the revised paper, we have provided soil types, soil pH, and organic matter content in Table 1.

10. Many grammatical typos, please correct: l. 40, 42, 43, 49, 68, 83, 85, 171

Answer: Sorry for these errors. In the revised paper, we have corrected them (L43, 45, 46, 55, 75, 90, 184).