

Reply to Reviewer#2

I greatly enjoyed reading this manuscript. The authors use thermal ramping to separate different stability fractions of SOM and then analyse them for carbon isotopy, C and N to investigate the relationship between SOM stability, C age and N content. They show that thermal ramping is a useful method for separating SOM pools. They find that more stable and older SOM is N-rich and discuss the mechanisms well. The manuscript is interesting and the approach seems to be useful, and refreshing, because density fractionation has become almost set in stone for separating SOM stability fractions. The findings about ON-rich stable SOM are scientifically interesting, the proof is novel and relevant for many disciplines across ecology. The finding that SOM age is related largely to clay content might not be most surprising, but is demonstrated clearly; a valuable finding. The finding that forest type does not affect SOM sequestration and its ON is novel and needs more discussion. The assumptions and interpretations are valid, methods and statistics are robust. The manuscript is written clearly and confidently, resulting in good style. There are not many references and they are repeated (except in the part about ON biogeochemistry which is fine), however this might be acceptable because the study is specific.

Even though this is a short format and not an applied study, I would have wished to read about how come it is so well established that broadleaf versus forests have different SOM quality, while the authors show SOM sequestration and ON is not controlled by forest type. It is, after all, in the first hypothesis. I leave it to the authors to figure out how to reduce this complicated topic and maintain the manuscript concise.

Structure comment: The introduction says that coniferous and broadleaved forests have different SOM quality. To the reader this implies that ON, too, will be different. Then, your alternative hypothesis is that the ON in old SOM will be same in coniferous and broadleaved forests.

20/25: Remove Hence.

170: Missing dot.

185: ... SOM that differs [...] from other SOM pools. Suggest adding why this is practical and biogeochemical significance of the different SOM pool.

We thank the reviewer very much for the very positive evaluation of our manuscript and for recognizing the value and novelty of the results.

To address the reviewer's comments, we will extend the discussion about the effects of forest type (broadleaf vs. coniferous) in the revised version of the manuscript. We found differences between broadleaf and coniferous forests in the C:N ratio of the bulk soil, but not in the C:N ratio of the very old organic matter fraction. The reason for this is likely a difference in the C:N ratio of plant detritus (which affects mainly the bulk soil) and a stabilization of organic matter on the surface of minerals (as indicated by the correlations with clay content), which affects mainly the C:N ratio of the very old fraction and is independent of forest type. We will also introduce the difference between broadleaf and coniferous forest with more detail in the Introduction. In addition, we will include more references.