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Interactive comment on "Response of carbon dioxide emissions to sheep grazing and nitrogen application in an alpine grassland" *by* Y. M. Gong et al.

Anonymous Referee #1

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General: The major objectives of the paper were to understand the interactions of grazing and N applications with temperature and rainfall (and hence growing season) on CO2 fluxes from alpine grasslands and to relate this to soil carbon stocks. The large number of treatments made it difficult to for the authors to provide convincing evidence on the impacts of the treatments and to tease out the mechanism of any measured changes or lack of response. In particular relating CO2 fluxes to soil C stocks was not clear in the discussion.

One suggestion is to split it into two papers to allow more thorough presentation of results and interpretation. Revision should also include greater care to be very concise in the text, particularly in the review section in the Introduction and to check consistency

in interpretation and presentation of the statistical significance of results.

Introduction: It would be good to understand more of the authors interpretation of previous knowledge. In some cases previous work is presented as a series of conflicting results without providing the reader with information on possible reasons and hence providing strong justification for the new research.

Discussion: There appears some inconsistency in different sections of the paper. For example in the Discussion (Section 4.4) there is the statement that: 'According to the CO2 flux calculation, Re emissions decreased by 4% owing to long term grazing exclusion which increased the above-ground biomass by a figure of 3. The Conclusions state '....our results confirm no significant changes in Re, Rh and Ra under short- or long-term grazing exclusion .....' If the difference isn't significant attributing it with causing a 3 fold change in biomass is difficult to justify.

In some cases the discussion and conclusions are not well related to the treatments. For example, N addition used different rates of ammonium nitrate fertilisation, so the statement in the discussion that response depended on the type of fertiliser is not justified from the treatments as described.

Conclusions: The important conclusion from the study is that a significant change in respiratory CO2 flux could not be measured with grazing or N fertiliser treatments but the significance in respiratory CO2 loss in the non-growing season means that studies should consider all of year emissions even in these alpine environments. The authors could be a bit clearer about the key messages.

Editorial; Consistency in treatment of comparisons e.g. % relative to the reference treatment or as a fraction, and in the level of significance presented e.g. Re is presented variously to 1 or 2 decimals. In some cases, typographical errors mean that units in the results table are not the same as in the discussion e.g. table 1 uses units for below-ground biomsass of x g 50cm-2 whereas in the text x g 50cm -3 is used.