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Interactive comment on "The influence of tillage on N_2O fluxes from an intensively managed grazed grassland in Scotland" *by* N.J. Cowan et al.

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This manuscript is a study about the effects of tillage on N2O emissions on Scottish grasslands. It covers an important topic regarding climate change with implications on land use change. However, several points were not clear (described below) and should be explained in more detail in the text. Based on these, I recommend revising the paper.

The study does not specify why 3 different measurements of N2O fluxes were used. Why not only use one method, probably dynamic chamber since it was not constrained by wind patterns (eddy covariance) or by agricultural activities (static chamber in tillage field)? Why was eddy covariance mast a primary method of data collection despite being able to take measurements only from one field at a time especially under the

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probability that 85% of wind would come from southwest as you mention (and low overall coverage – 27 and 25%)? Explanation and rationale behind these decisions would be useful.

There is an issue with the estimated emissions of N2O due to tillage (1.08 $\pm$ 0.14 kg N2O-N ha-1). Its calculation was based on the assumption that N2O emissions are constant throughout the year with no tillage or fertilizers. How were other factors that might have influenced baseline N2O emissions throughout the year accounted for in this calculation? A comparison could have been made with untilled field if it was not fertilized throughout the study period along with tilled field. Is there a reason why the land was not divided into 3 fields where the additional one would have been the control field with no tillage and no fertilizers?

There seems to be a correlation between spikes in N2O shortly after fertilization in untilled field and N2O in tilled field. How do we know that the fertilization did not influence also N2O fluxes in tilled field, e.g. by wind which would blow N2O from untilled to tilled field and after that it would be registered by eddy covariance mast as from tilled?

Net effect of tillage could be included in the study by subtracting increased uptake of nitrogen by growing grass post-tillage from increased emissions caused by tillage. This would show an overall impact of tillage.

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