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Interactive comment on "Wintertime carbon uptake of managed temperate grassland ecosystems may influence grassland dynamics" *by* Genki Katata et al.

Anonymous Referee #1

Received and published: 9 October 2019

General Comments: Overall, the paper does an excellent job using a process-based model to look at a critical period associated with montane grassland plants, the winter. Grasslands store lots of carbon belowground as roots and create a rich OM soil layer. The authors build a good argument for why they want to look at carbon fluxes and allocation during the winter months. The presentation of model results is good, and their conclusions adhere to what was found in their results. I do not have any major concerns with this paper as it stands.

Specific Comments: The authors discuss low temperature photosynthesis in both the introduction and conclusion but do not go further in depth about temperature thresh-

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Discussion paper

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olds other than 5C when rubisco is very limited by temperature. I would suggest that the authors give a little more in the introduction about cold stress dynamics in relation to rubisco. The second aspect of the carbon dynamics that should be addressed is how water movement is impacting photosynthesis and carbon allocation within the grassland at these low temperatures. The dynamics associated between photosynthesis and water need to be stated, especially when discussing freezing conditions that occur during winter. The last specific comment I have is that the authors talk about the grasslands as fodder for livestock and its importance in the introduction, but the authors do not revisit this broader impact in the discussion.

Technical Corrections: Pg 2 lines 25-27 – This is an awkward sentence. Pg 2 line 33 – I do not understand what is meant by ". . . the above change in snow cover conditions. . .", please state what changes in snow cover conditions, make the readers job easy to remember conditions or treatments. Pg 8 lines 220-225 – Please look at Sage and Kubien 2007 Plant, Cell and Environment. This article discusses how temperature influences Rubisco, maybe a useful article for refence to help. Figure 1 – This is an extremely complicated figure and hard to understand. This figure might be better suited as a supplementary figure. To help improve clarity of the figure I would suggest decomposing the figure into easier to understand panels. For instance, maybe have one panel that focuses on atmospheric parameters, another on plant processes, and another on soil processes. I do understand that many of the processes are inter-connected. Figure 3 – The choice of having red and green on same figure is not color blind friendly. If one of the colors could be changed to a color-blind friendly palette that would enhance the clarity of the figure for all readers. Figure 6 – When printed in black and white the two colors orange and grey are too similar, please darken the grey to create a greater contrast between the two for improved interpretability when printed.

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