

Biogeosciences Discuss., referee comment RC2
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Comment on bg-2021-193

Anonymous Referee #2

Referee comment on "Radiation, soil water content, and temperature interactions with carbon cycling in an alpine swamp meadow of the northeastern Qinghai-Tibet Plateau" by Junqi Wei et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-193-RC2>, 2021

Wei et al. did an interesting job about carbon balance of an alpine swamp meadow on the Qinghai-Tibet plateau, enriching the dataset of carbon fluxes in alpine wetland. This study highlights that decreasing in soil water content in this wetland ecosystem can stimulate ecosystem respiration significantly and weaken ecosystem carbon sink strength as a result. The writing is good and data processing is reasonable. Some major concerns in data interpretation should be addressed.

Major Comments:

1. In section 3.3, radiation has been identified as the main driver for the variation of GPP and NEE, and air temperature as the second force. However, in section 4.2 and 4.3, only the role of air temperature is discussed through the comparison of different study periods and different studies. This may confuse the reader because the main driver for NEE seems inconsistent in the Result and Discussion section. The authors may want to highlight the role of warming on carbon fluxes, but a statement or discussion on radiation is necessary to make the manuscript with good clarity.
2. In section 4.1, two groups of data (the late growing season of 2014 and 2015) were used to analyze the effects of soil moisture on carbon fluxes. Although the authors declared that air temperature and phenology of these two periods were comparable, I could not find information about radiation of these two periods. As radiation has already been concluded as a main driver for the variation of GPP and NEE in the Result section, it is critical to build the comparison based on comparable radiation, or the results can be pointless. The same issue goes for the comparison between the late growing season of 2014 and 2018 in section 4.2 (L322-324).
3. The comparison between the late growing season of 2014 and 2015 shows that drought in 2015 stimulated Re noticeably (L279-282). However, the differences in GPP between these two periods are not significant (L290), the authors should be more careful to make the statement that high soil water content would suppress GPP (L287-295). Figure 5 shows that the contribution of soil water content to the variation of GPP is small on all the time scales.

4. The authors concluded that warming would weaken carbon sink strength in this alpine swamp meadow ecosystem because it would increase R_e more than GPP. The authors also pointed out that other studies have reported opposite results that warming would stimulate GPP more than R_e . However, these studies were conducted in different ecosystems, such as Arctic marshlands and Arctic tundra (L334-341). A discussion that focuses on alpine swamp meadow would be more worthwhile for understanding the effects of climate warming on carbon balance of alpine wetland ecosystem.

Specific Comments:

1. The font of ' CO_2 ' in the draft should be the same as others.
2. *Potentilla* in Line 96 and *Kobresia* in L121 should be italic.
3. L174-175: what do you mean by 'this is one random forest per hour of the day, day of the year and year, respectively'?
4. Figure 4 and Figure 5 should have tags.
5. L373-379: The stronger C sink strength is first attribute to saturated soil condition rather than lower temperature, but then to higher precipitation and lower temperature.
6. The data supports the opinion that soil water content is a key control on ecosystem respiration, but soil water content does not affect the overall C sink strength (i.e., NEE) directly.