

Interactive comment on “Soil moisture control over autumn season methane flux, Arctic Coastal Plain of Alaska” by C. S. Sturtevant et al.

Anonymous Referee #4

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The manuscript by Sturtevant et al. is reporting on methane fluxes from the coastal plain of Alaska in the geographical area subject to a large scale “Biocomplexity Experiment” hosting water table manipulations and a range of different associated experiments and measurements. The methane flux measurements have been conducted by the eddy covariance technique using two early versions of the now commercially available LICOR-7700.

The data presented are interesting from an instrument evaluation point-of-view and they clearly reflect the problems and consequently many holes in the data series that arise from child-diseases etc of any new instrument. The manuscript also presents some interesting albeit rather predictable responses with respect to the relationship between the manipulated water table depth and active layer development, i.e. more

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water in the system -> more energy conducted -> deeper active layer.

There are many details and interesting parts that may be discussed as already seen in the interactive correspondence but a main and serious problem this reviewer has with the manuscript is the fundamental direction it takes in targeting the issue of the autumn methane burst in tundra environments. The authors have apparently many other interesting data that will be published elsewhere but this particular communication is brought forward as providing what is needed for a comparison with the first observations of this phenomena reported by Mastepanov et al. (Nature, 2008). The fundamental problem is that this manuscript does not present any data that can provide a conclusive answer as to whether or not there could also have been an autumn burst in the year of presented measurements at Barrow. The data coverage is simply too sparse and doesn't extent deep enough into the frozen season to say anything about the issue.

From Figure 1 in Mastepanov et al. (2008) it is clear that at a comparable site to Barrow the burst does not start before the frozen top horizon is at 10 cm and peaks when it reaches 15 cm. The current manuscript does not show any data from when the freeze has progressed to this point. A final clump of 2-3 days worth a data around the time of the freezing front reaching 10 cm (Figure 3) is showing still sizeable emissions (surprising by conventional standards) indicating that there may well have been a burst starting but it was just not recorded. Based on the data presented in this manuscript we simply cannot draw any conclusion in relation to the possible presence of an autumn burst at Barrow.

Judging from the above mentioned and the fact that a lot of volume in this manuscript is directed towards the autumn issue this reviewer does not find it worth communicating any further. With a shift of emphasis, however, towards issues that the manuscript do document (water table controls etc) it could be worth reconsidering. But it seems it may then just as well be merged with other ongoing publication preparations based on the same data gathering efforts.

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