In-situ observation of greenhouse-gas flux at proglacial grounds of a glacier –preliminary result for Gulkana Glacier, Alaska-

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Methane is one of the major greenhouse gases (GHG), and the variation of its concentration in the atmosphere has the potential to bring a significant impact on the global climate and carbon cycle. The methane emission in the Arctic regions, which is largely attributed to the methane production in the seasonally freezing layer, has been considered to be enhanced by thawing of permafrost and to be one of the sources of uncertainty for future climate projection. On the other hand, a notable amount of methane emissions from the proglacial ground surfaces after retreats of glaciers in Greenland and Iceland have been reported (e.g. Lamarche-Gagnon et al., 2019; Burns et al., 2018). Those newly-recognized methane hotspots may exist in other proglacial areas, which could influence on estimation of global methane budget. However, field evidence for the large methane emission is still limited and there is a lack of information about other proglacial areas.
We carried out the field experiments in the Gulkana Glacier in the Alaska Range, United Status. The objective of our study is to measure methane fluxes at the proglacial area of a small mountain glacier to verify if the large emission can be observed as reported in Greenland and Iceland, and expanding the field data towards the evaluation of the generality of previously reported methane emissions. The observation was conducted on 15 and 16 July 2019, one month after the onset of melting of the glacier, at 18 locations in the terminus of the glacier. The in-situ observation was conducted with the chamber method (Morishita et al. 2019). The chambers were set on dry, wet, and inundated ground surfaces to capture differences in the surface conditions. Gas samples were also taken for the isotopic analysis. A small emission was observed at seven locations, most of which were wet surfaces. Stable isotopes in the emitted methane and carbon dioxide imply that the methane was generated by microbial process. Our observed methane emission was small in mid-July and previous studies detected high methane emission at the end of June starting with higher discharge. Therefore, it is plausible that larger methane emission occurs in earlier and warmer melting seasons.

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