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Soil CO₂ emission in the boreal zone of Central Siberia: raised bog and lichen pine forest ecosystems

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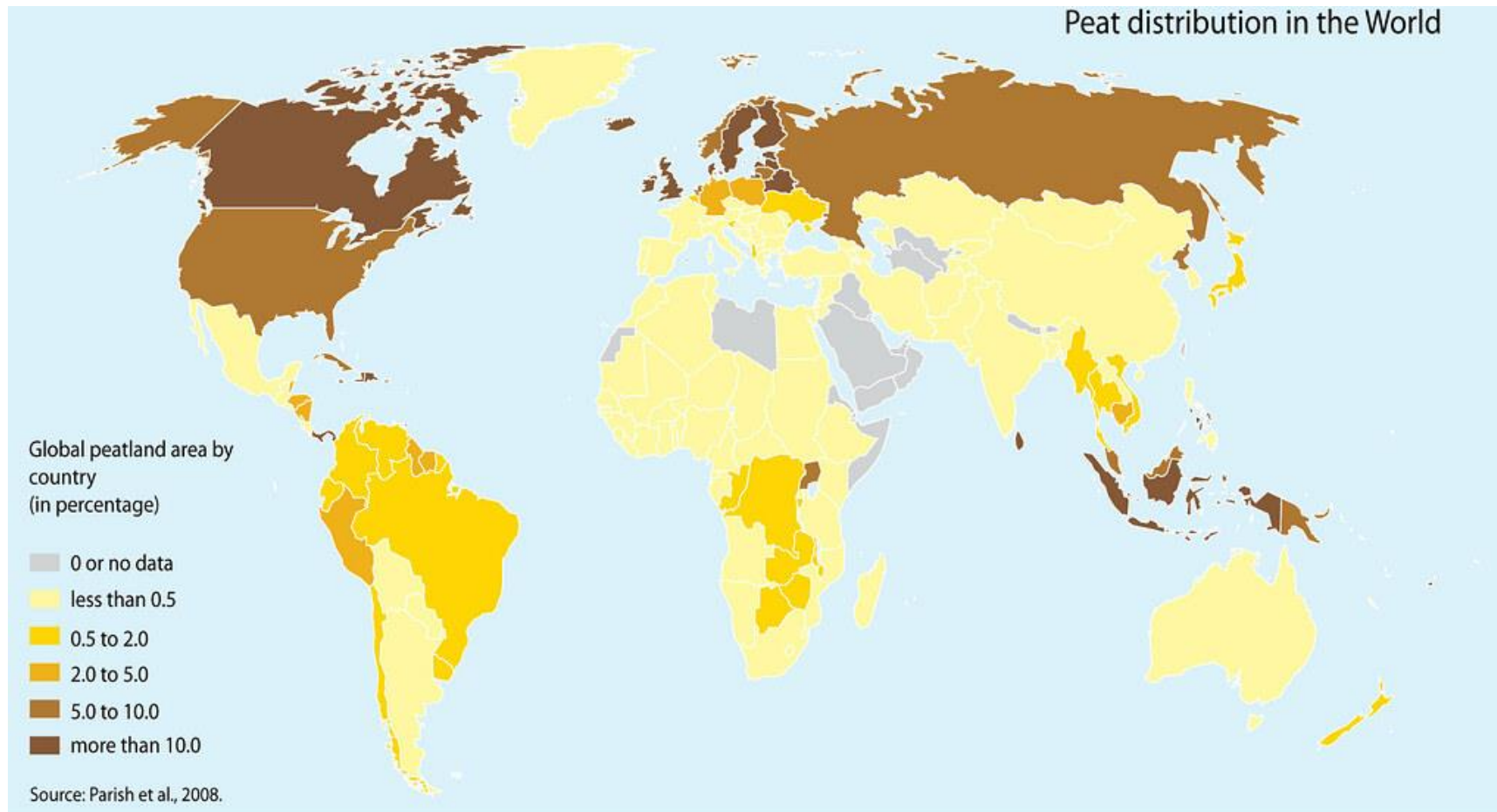


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Background

Predictions - The northern bogs and peatlands as an additional source of atmospheric CO₂.

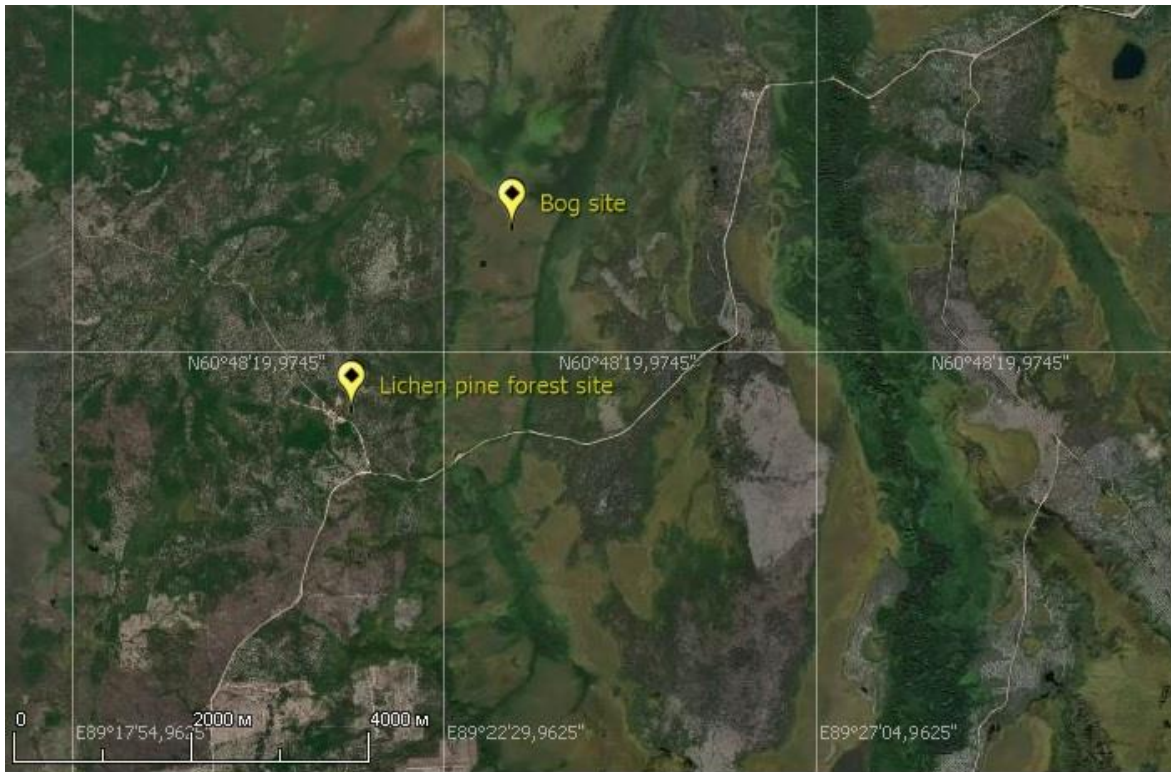


Main Focuses

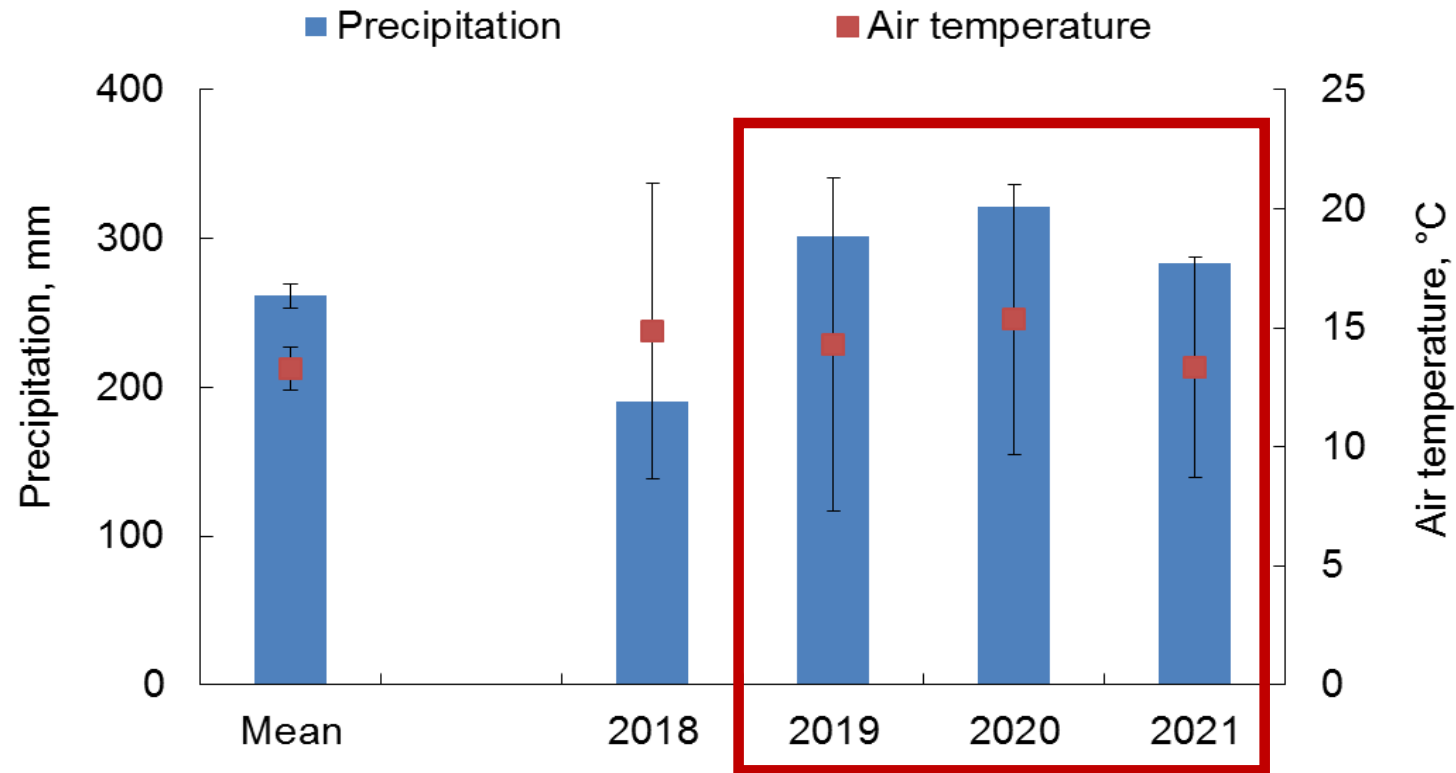
- How CO₂ soil efflux differs in oligotrophic soils of well-drained pine forest and waterlogged sphagnum peatland located within a single watershed?
- What is a spatial variation of the CO₂ emissions within the sphagnum peatland provoked by heterogeneity of microtopography (mounds vs. hollows)?
- What are the main microclimatic drivers of CO₂ emission dynamics during a growing season in the pine forest and the sphagnum peatland?
- Which area released more CO₂ in a seasonal scale?

Research Area

- Krasnoyarsk region, Russia ($60^{\circ} 48' \text{ N}$, $89^{\circ} 22' \text{ E}$) close to the International research station – ZOTTO (<http://www.zottoproject.org>).



Meteorological data



*data are given for the growing season (June-September)

The mean values calculated using the data for Bor (61°36'N 90°00'1E) weather station (<http://www.meteo.ru>)

Study sites & Methods

Duration of measurements: summer seasons (June-September) 2019-2021.

Direct measurements:

- CO₂ emission (LI-8100A, Li-Cor Biogeosciences Inc., USA),
- soil temperature (Soil Temperature Probe Type E, Omega, USA),
- soil moisture (Theta Probe Model ML2, Delta T Devices Ltd., UK).

Frequency of measurements: lichen pine forest – ones a week, bog site – ones per 10 days.



Lichen pine forest
60°48'24.3"N, 89°21'26.7"E



Bog site – Mounds
60°49'03.2"N, 89°23'20.5"E

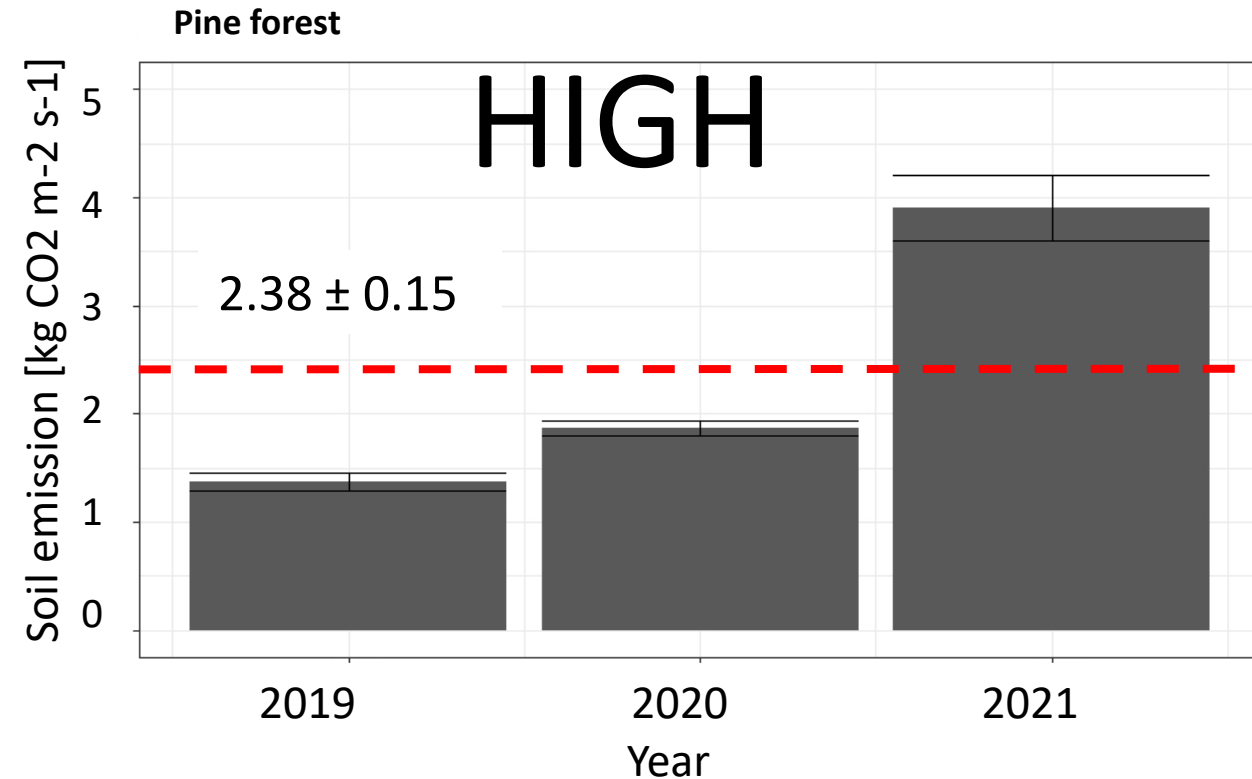
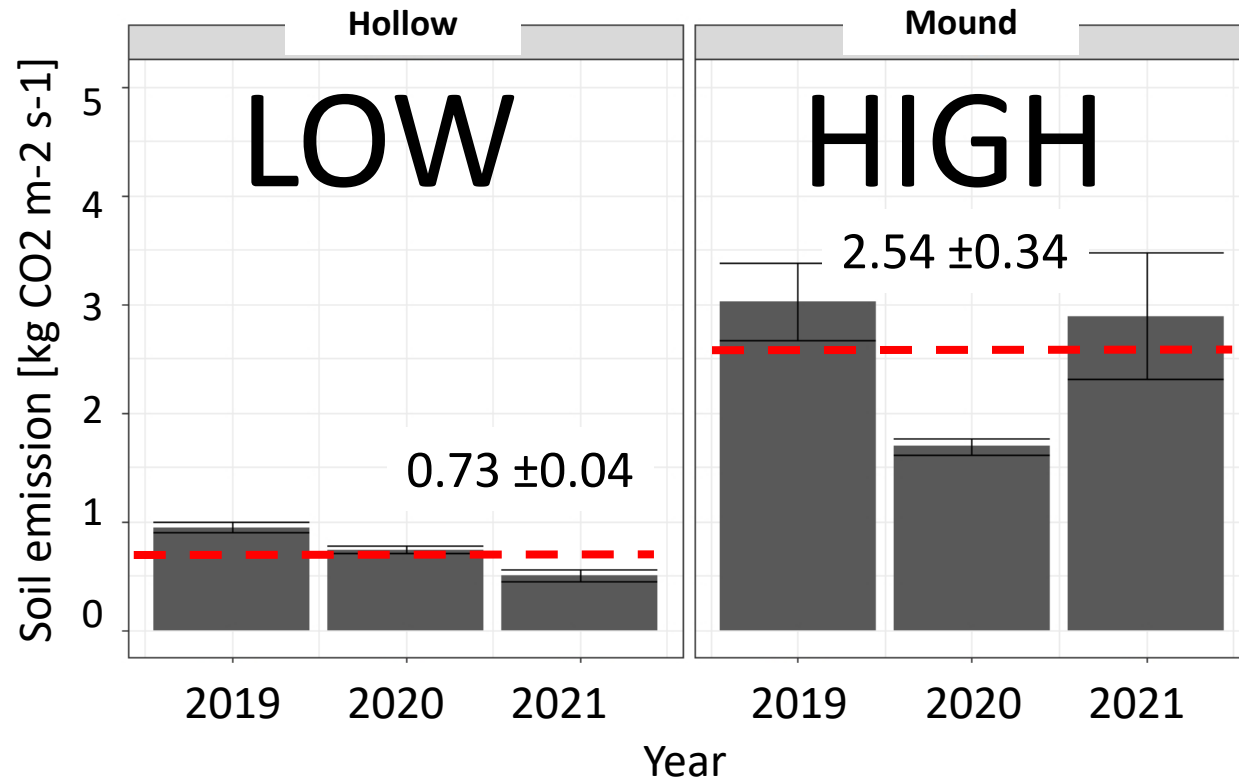
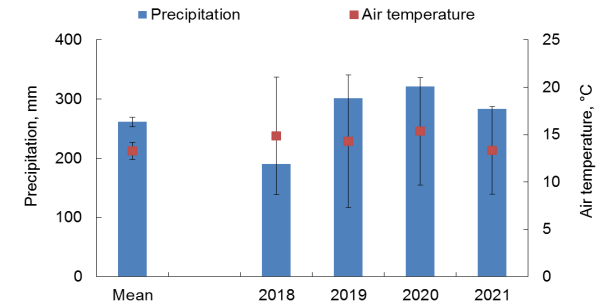


Bog site - Hollow



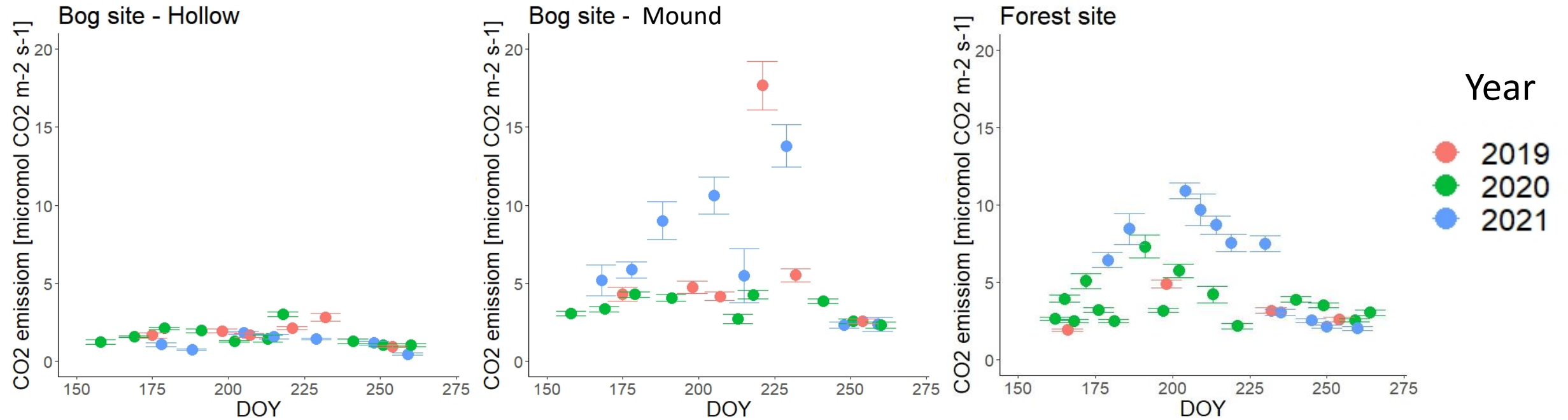
MOUND FLUXES AS HIGH AS FOREST FLUXES

- The seasonal CO₂ emission varies widely within the bog area depending on the microtopography of the area: hollow site – 0.73 ± 0.04 , mound site – 2.54 ± 0.34 , lichen pine forest – 2.38 ± 0.15 kg CO₂ m⁻².

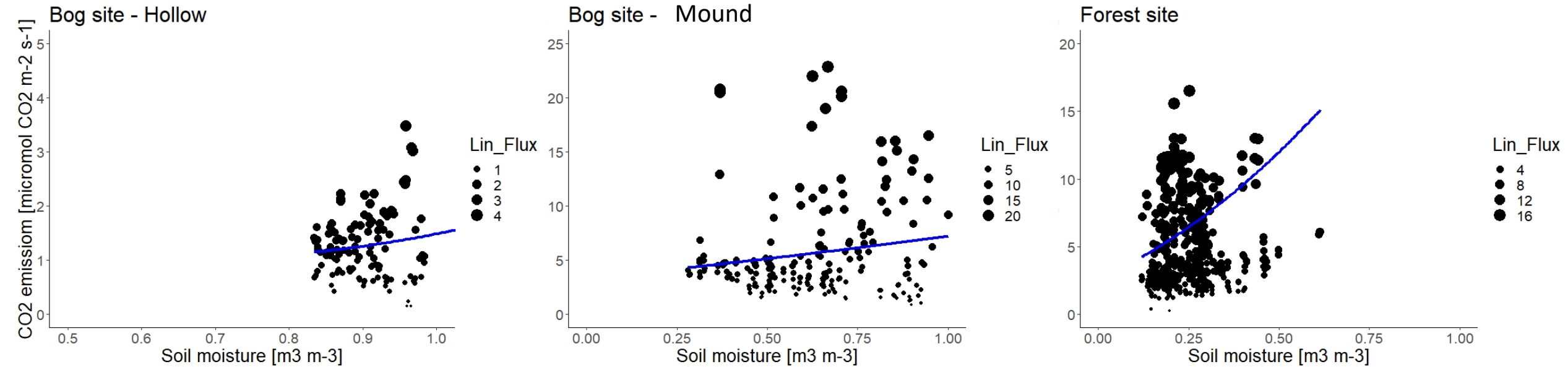


Results

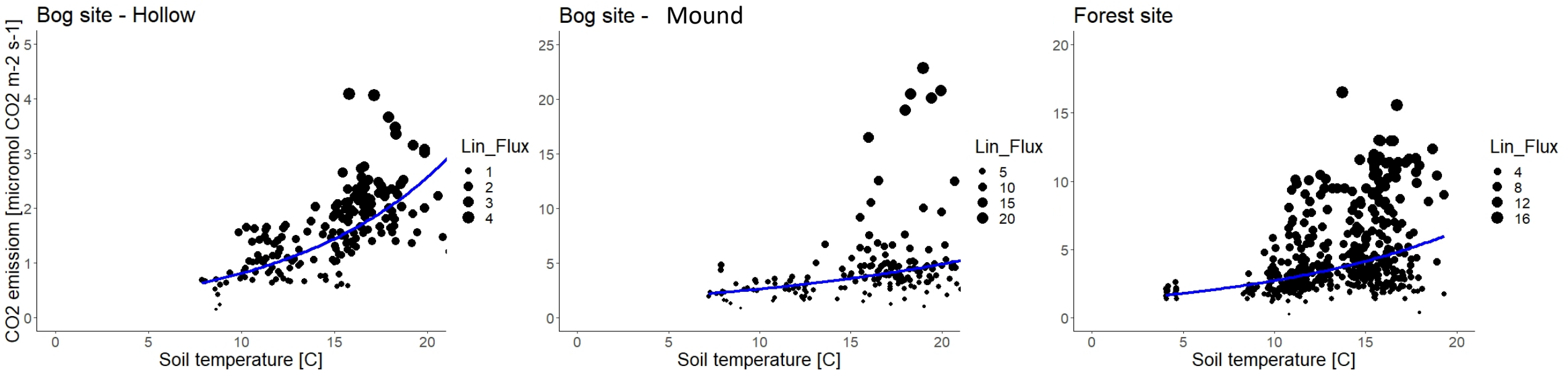
Seasonal dynamic of the CO₂ emission.



No evidence of water limitation of fluxes



Temperature partially controls soil flux



Summary

1. The upland parts (mound) of the sphagnum peatland and lichen pine forest demonstrated similar CO₂ emission rates during the summer season.
2. The seasonality in CO₂ emission dynamic observed at the lichen pine forest and mound site.
3. The seasonal CO₂ emission is not clearly related to the soil temperature and soil moisture.
4. During the summer season the emission rates probably control by the additional factors such as water level, substrate input and others.



Thank you for Your Attention!

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