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Carbon photoassimilation by dominant species of mosses and lichens in pine forests of Central Siberia

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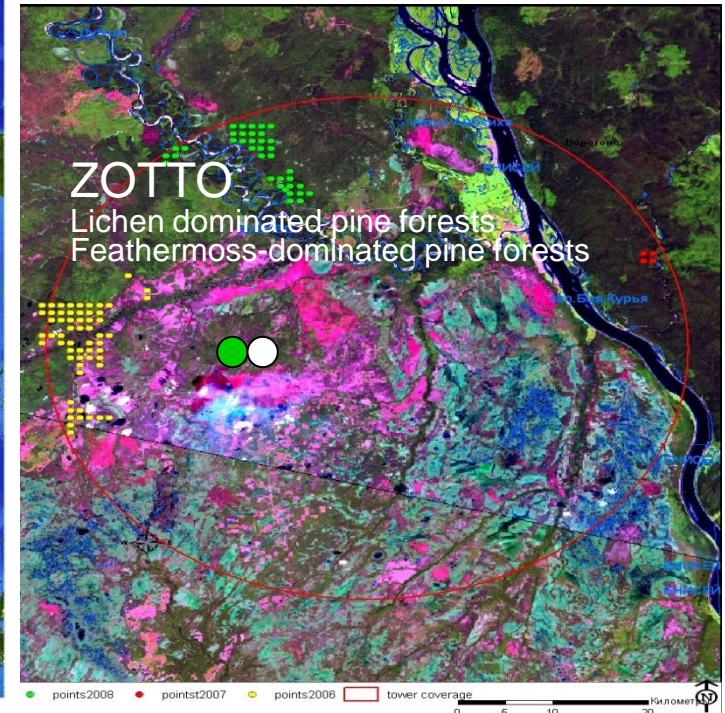
The contents:

- Aim, study areas and objects
- The phyto (bio) mass stocks and gas-exchange measurements
- Result and discussion
- Summary



Aim, study areas and objects

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This work aims at was to determine the stocks of moss-lichen stratum and photoassimilation activity of its dominant species during the growing season.

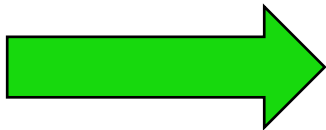
The study has been conducted in Central Siberia near Zotino tall tower observatory (ZOTTO, 60° N, 89° E) in lichen- and feathermoss-dominated pine forests.

The phyto (bio) mass stocks and gas-exchange measurements:

To assess the phyto (bio) mass stocks the grass-shrub and moss-lichen layers were sampled in 100 replicates in each type of forest from 20x25 cm subplots ($S = 50 \text{ cm}^2$).

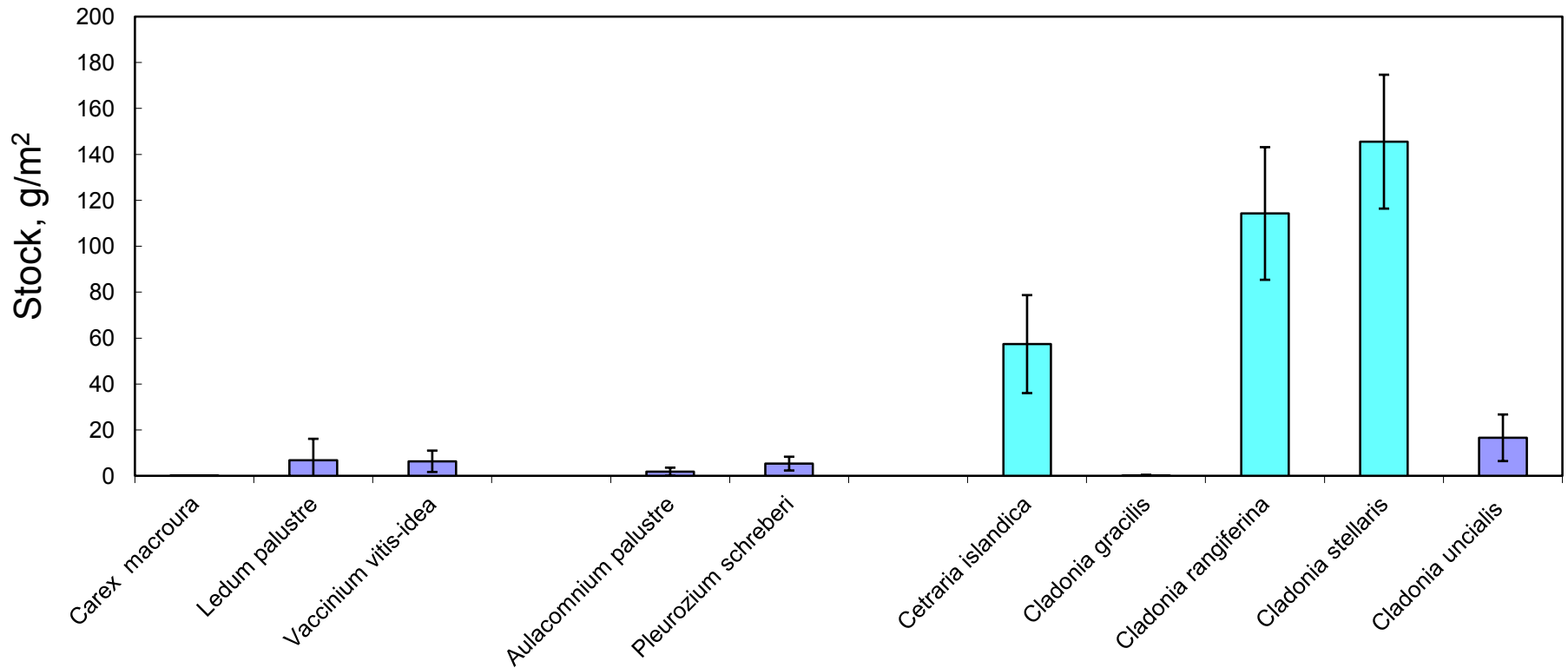
The intensity of CO_2 photoassimilation was determined in situ by Walz GFS-3000 (Heinz Walz GmbH, Effeltrich, Germany) infrared gas analyzer.

A portable open-flow infrared gas analyzer (GFS-3000, Walz, Effeltrich, Germany)



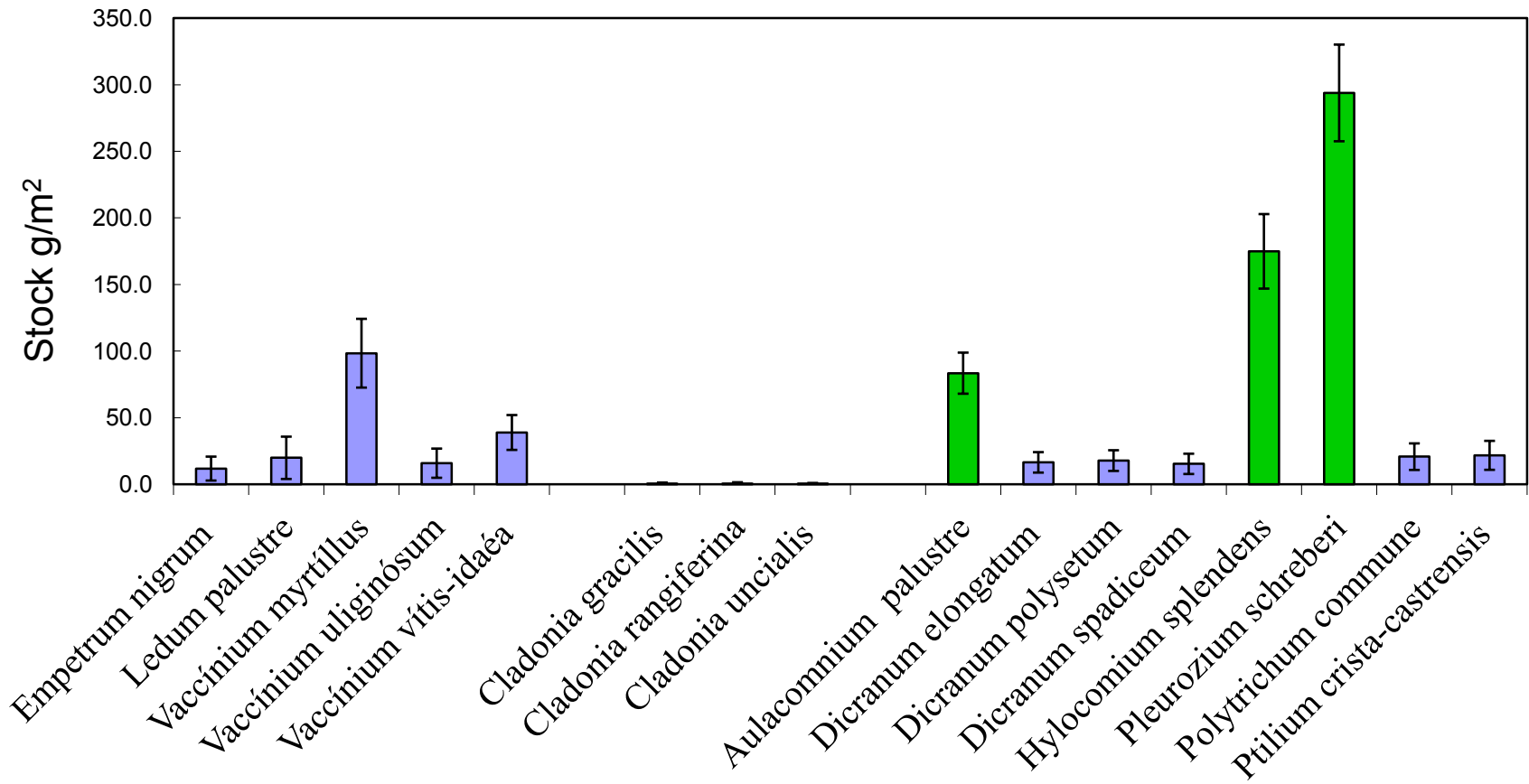
Result and discussion:

The phyto (bio) mass stocks the grass-shrub and moss-lichen layers in lichen dominated pine forests



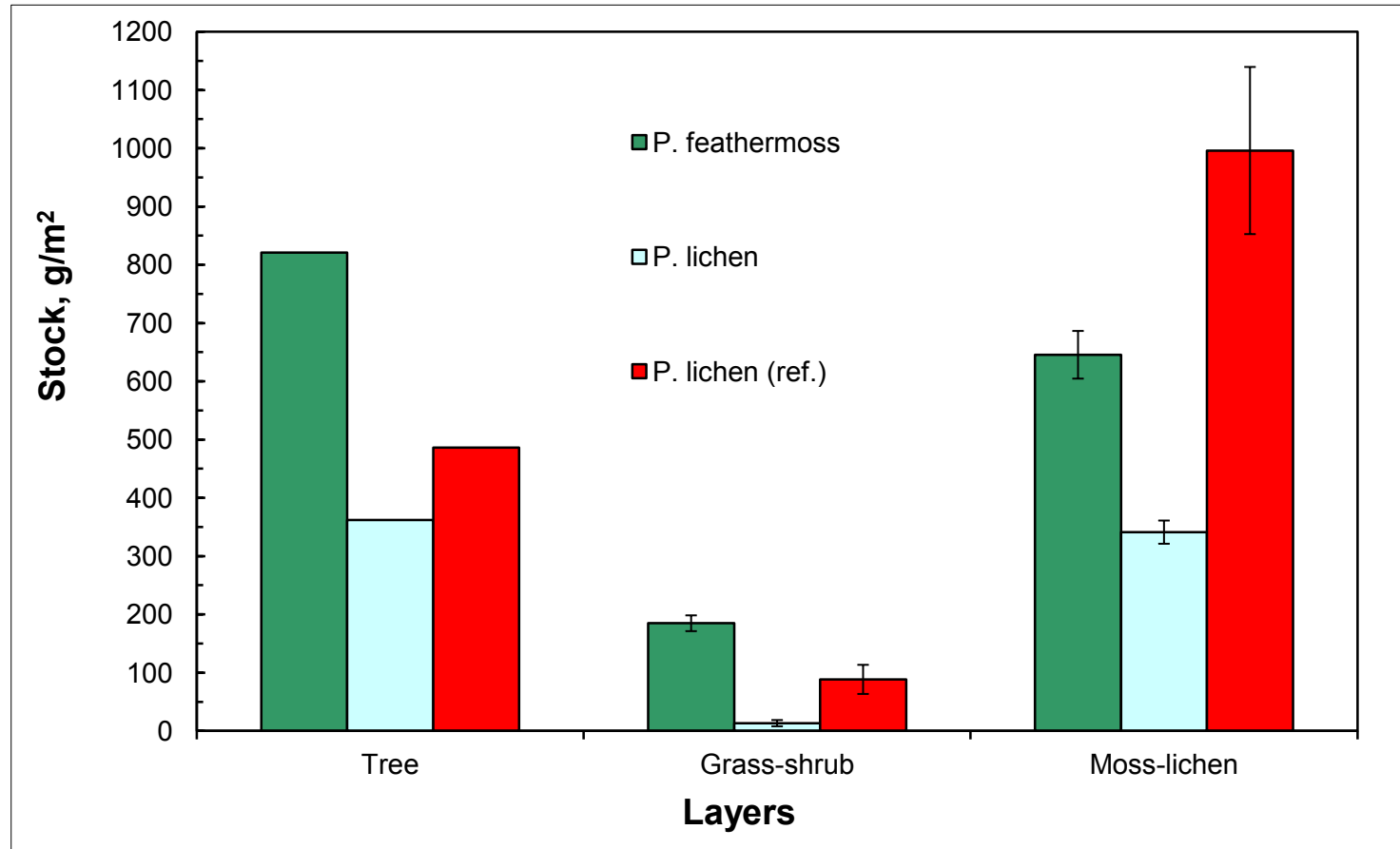
Dominant species: *Cladonia stellaris* (Opiz) (41%), *Cladonia rangiferina* (L.) (32%), *Cetraria islandica* (L.) (16%).

The phyto (bio) mass stocks of the grass-shrub and moss-lichen layers in feathermoss dominated pine forests



Dominant species: *Pleurozium schreberi* (Brid.) Mitt (35%), *Hylocomium splendens* (Hedw.) Schimp (21%), *Aulacomnium palustre* (Hedw.) Schwägr (10%).

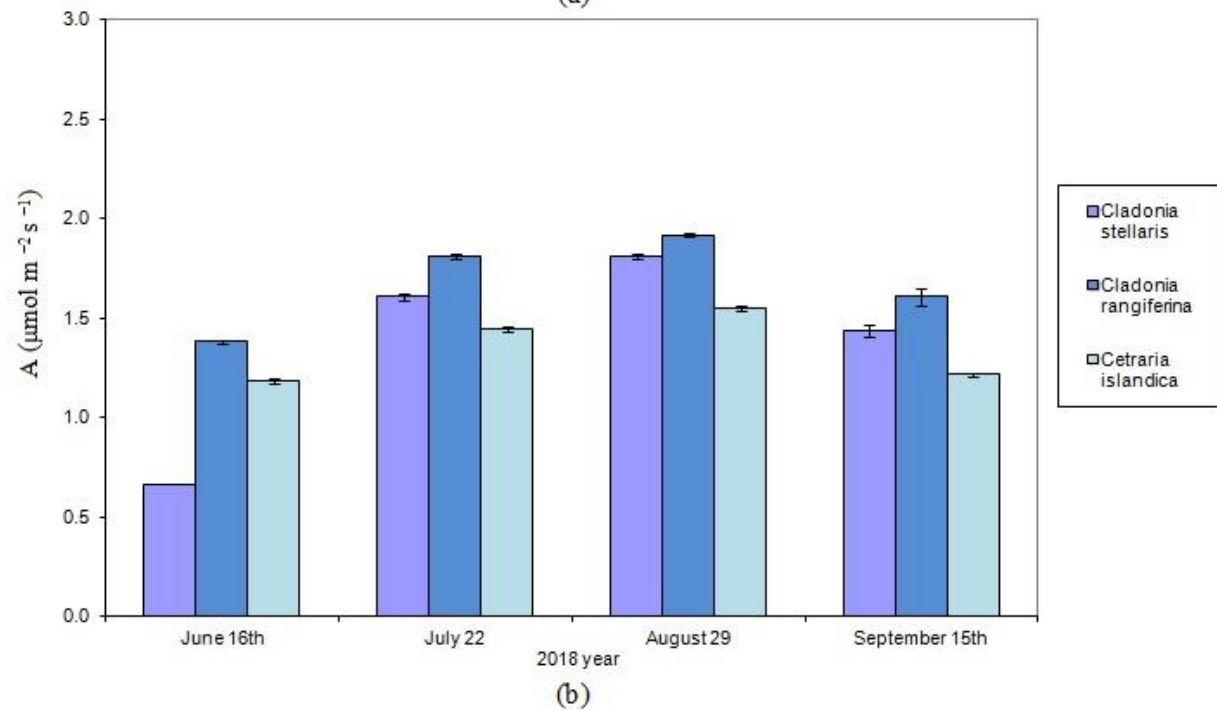
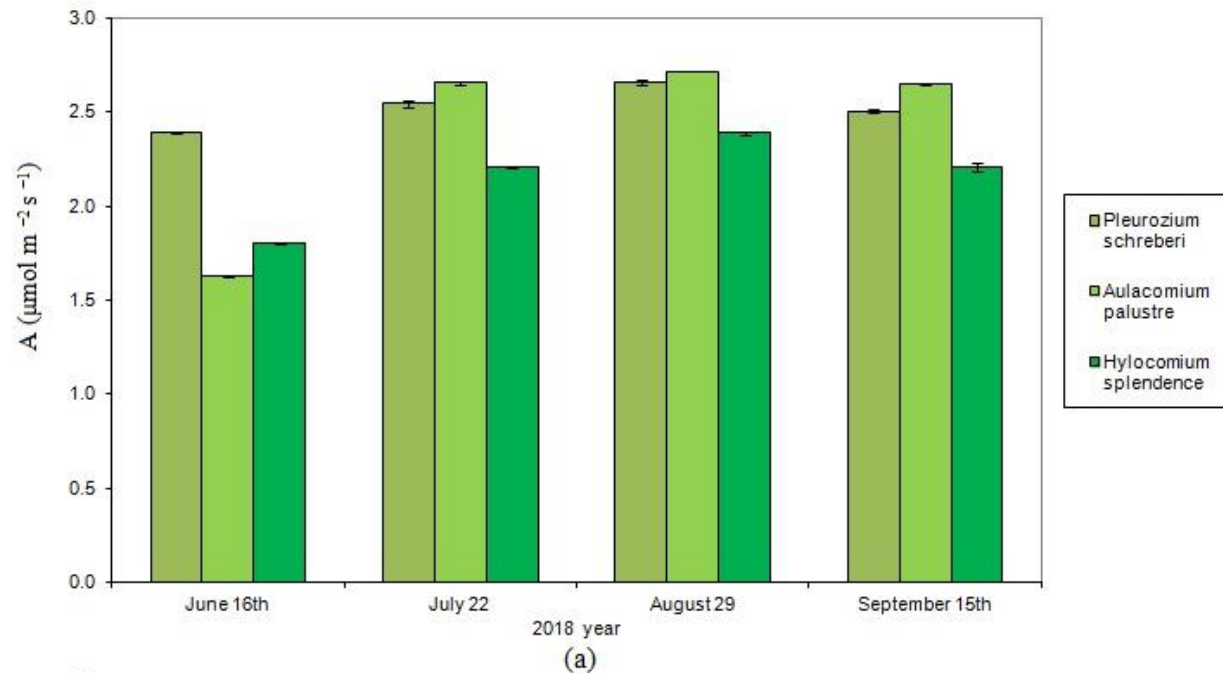
Stocks of organic matter of subordinate layers of vegetation and phytomass of the tree layer



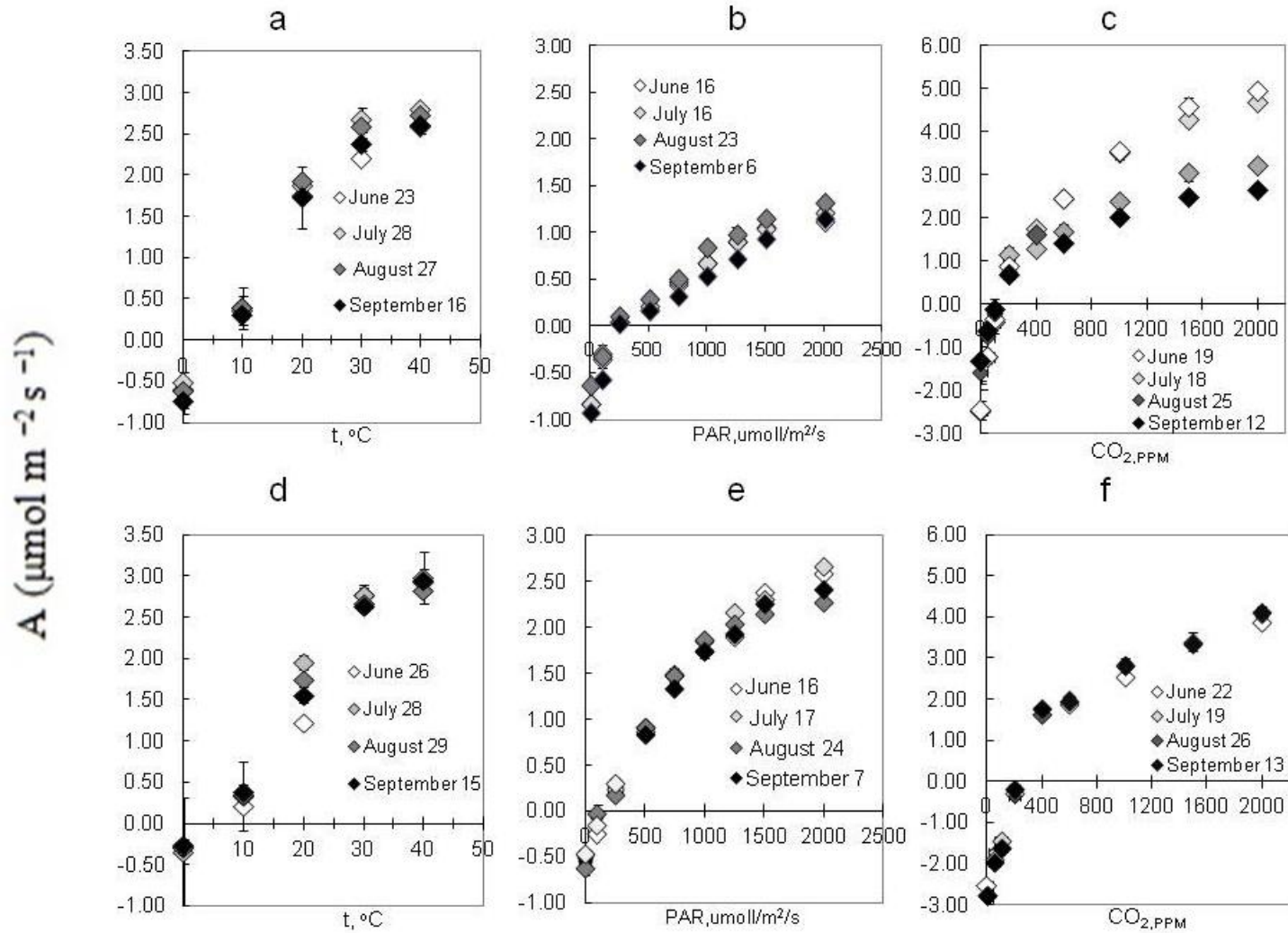
The moss-lichen layer accounted for 78-96% of the total phytomass of ground floor in studied pine forests and comparable (486 g/m²) to the photosynthetic phytomass of the tree canopy (pine needles).

Photoassimilation activity of the dominant moss (a) and lichen (b) species in pine ecosystems the during growing season different days of growing season

The intensity of photoassimilation in lichens is somewhat lower than that noted for mosses, but it is most pronounced in the growing season.



The response of photoassimilation intensity of *Cladonia stellaris* (Opiz) and *Pleurozium schreberi* (Brid.) Mitt. to air temperature (a and d), PAR (b and e), CO₂ concentration (c and f) at different days of growing season.



Temperature increased the intensity of CO₂ assimilation and no inhibition was observed at maximum T used in our study (+40 °C).. There were no differences in the temperature dependence of CO₂ photoassimilation between feathermosses and lichens. Mosses showed 2-fold larger response of CO₂ assimilation intensity to increase of PAR comparatively to lichens.

Summary:

- o The stock of the phyto (bio) mass of the moss-lichen layer in the pine forests of the study area are comparable to the photosynthesis phytomass of the tree layer.
- o The moss-lichen layer accounts for 78-96% of the total phytomass of the ground cover in pine forests of Central Siberia.
- o The dominants of the moss-lichen layer retained high photoassimilation activity throughout the growing season when the studies were carried out (June-September 2018).
- o The rate of photosynthesis mosses and lichens showed log growth with increasing light, CO₂ concentrations and temperature.

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Thank you for attention!