

The initial performance tests of the Closed Geosphere Experiment Facility (CGEF) for the investigation of ecosystem carbon cycles

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The Closed Geosphere Experiment Facility (CGEF) is designed to investigate carbon cycles of terrestrial ecosystems because of its airtightness. A wetland ecosystem is scheduled to be introduced to the CGEF. The size of CGEF is a $5.8 \times 8.7 \text{ m}^2$ ground area and 11.9 m average height including 3.1 m soil depth. The facility serves as an experimental means for analyzing ecosystem processes on carbon cycles under controlled conditions. Air temperature in the CGEF was controlled near setting points. The CGEF has heterogeneous light intensity, which decreases from south to north. Effects of heterogeneity on plants were estimated using pot-grown plants, which are scheduled for introduction into the CGEF. Amounts of evapotranspiration were higher for the south than north side. No significant difference in growth (vegetation height and culm density) detected between the south and north side. Concentrations of N, P, Na, K, Ca, and Mg in plants show the similar value between south and north side. We conclude that there is no serious problem attributable to heterogeneity of light conditions against plants for a growing season. The degree of airtightness was investigated for the facility and the air exchange rate was about 6.66×10^{-3} per hour. Thus, the carbon budget of the wetland ecosystem is easily investigated by monitoring the product of gaseous carbon (CO_2 and CH_4) concentrations and amounts of ventilation in CGEF due to its airtightness. The initial performance test shows the CGEF to be a suitable facility for investigating carbon cycles of a wetland ecosystem.