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Effects of fence on daily variation of CO₂ flux from the soil in Subalpine meadow of Xinjiang

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Key words : fence protection ,subalpine meadow ,CO₂ flux ,soil

Introduction The carbon cycle is the important research content of terrestrial ecosystems (GCTE) . Grassland ecosystem as one of the most important type in terrestrial ecosystem accounts for about 25% in total land , and it is one of the ecosystems that have the most obvious response to atmospheric CO₂ increase and global warming .

Material and method The experimental grasslands are the 4 fields in Bayinbuluke Grassland Ecological Station , Xinjiang . They were fenced for 25 years . In order to measure greenhouse gas CO₂ emission , dark enclosed chamber method is used to observe greenhouse gas emission inside and outside the fenced plots . Following formula was used : $F = \frac{\Delta m}{\Delta t} \cdot DV / A = h \cdot D \frac{\Delta m}{\Delta t}$

Where : F= gas flux (g/m² · h) , V= the volume of observation box , A = soil area surrounded by observation box , D= gas density inside box .

Results and discussion

The flux on daily variation CO₂ emission flux fenced plot By comparative analysis to soil CO₂ flux on the treated grassland for 25 years inside and outside the fence , it can be seen that : CO₂ emission flux inside fence is obviously higher than that outside the fence .

The relationship between CO₂ emission flux and ground temperature In one day , CO₂ emission flux inside and outside are basically fit with daily change of ground temperature at depths of 5cm and 10cm inside and outside the fence , and significantly positive correlation is present between them ; the correlation coefficients inside are 0 .7118 , 0 .6753 , respectively ; correlation coefficients outside fence are 0 .6777 , 0 .6549 , respectively .

Relationship between CO₂ emission flux and soil water potential Correlation analysis between soil CO₂ emission rate and soil moisture showed that soil CO₂ emission rate has an exponential correlation with soil water potential , and correlation coefficient is 0 .6077 outside fence , 0 .4866 inside fence . Correlation coefficient outside fence is higher than that inside fence , which is caused by soil hydrothermal coupling effect difference between inside and outside fence .

The total daily CO₂ emission inside and outside fence The total daily CO₂ emission inside and outside fence is an important indicator to measure if fencing has an improvement on the soil . Total daily CO₂ emission outside fence is 14 .465g/m² · d , total daily CO₂ emission inside fence is 19 .117 g/m² · d , 32 .16% more than outside fence . After fencing , soil organic matter has a certain accumulation .

Conclusions Daily variation of CO₂ emission flux of summer soil inside and outside fence has a obvious positive correlation with ground temperature at depth of 5 cm and 10 cm . Daily variation of soil CO₂ emission flux both inside and outside fence has correlation of indices with soil water potential . At the same time , maximum soil CO₂ emission flux occurs when soil water potential is at 29 kpa ~ 35 kpa . The fencing has a promotion role on accumulation of soil organic matter .

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