

Influence of grazing on surface heat balance , vegetation and carbon dioxide flux over the Mongolian grassland

KATO Hidekazu¹, MARIKO Shigeru¹, URANO Tadaaki² and SUGITA Michiaki¹

¹ Graduate School of Life and Environmental Sciences, University of Tsukuba

² Master's Program in Environmental Sciences, University of Tsukuba

Introduction

- Mongolia locates in dry to semi-dry area.
- The grazing has carried out for more than 2000 years.
- Recently in Mongolia the social system changed radically.
- The serious influence of such a change is anticipate.

The object of this study: to assess influence of grazing on ground surface heat balance, vegetation and carbon dioxide flux over the Mongolian grassland.

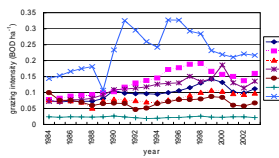
Study area

- A steppe grassland in Kherlen Bayaan-Ulaan (KBU, 47° 28' N, 108° 78' E, 1200 m a. m. s. l.)
- A protected area (200 m by 170 m) constructed in 2002/8 to study grazing impact.
- The data sets of the protected area and a grazed area were used.

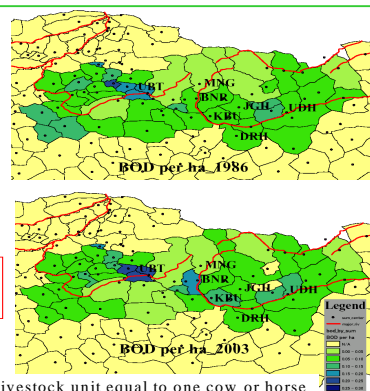
Data (June 2003 and June- July 2004)

- Heat fluxes at flux stations [$W m^{-2}$]
- CO_2 flux measured at flux stations and by Closed Dynamic Chamber method (CD method) [$\mu mol m^{-2} s^{-1}$]
- Net Ecosystem Production (NEP) calculated CO_2 flux [$mg CO_2 m^{-2} s^{-1}$]
- Biomass [$g m^{-2}$], LAI
- Grazing intensity [$BOD ha^{-1}$]

Grazing intensity

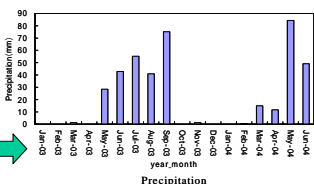
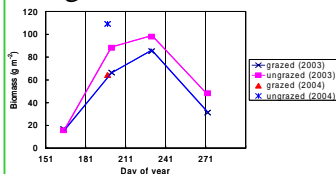


Maximum number of BOD per ha appears in 1998 or 1999 when the social system changed radically.



BOD: Mongolian livestock unit equal to one cow or horse

Vegetation

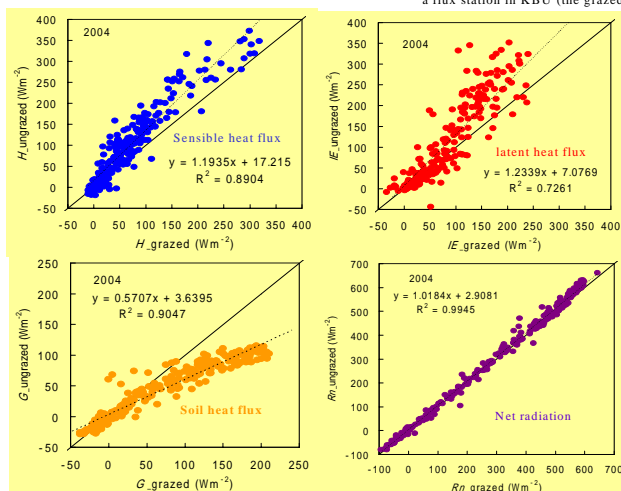


- Grazing activity appears to control biomass.
- The values of both sites in 2004 are higher than in 2003 because precipitation between April and June in 2004 was about twice of that in 2003.

Comparison of heat flux between grazed and ungrazed site



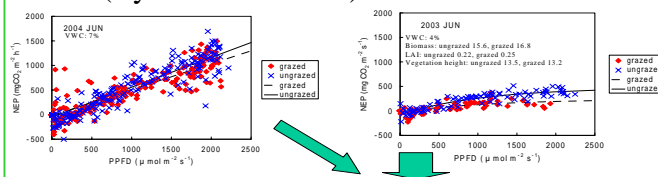
a flux station in KBU (the grazed site)



- G values of ungrazed site are about half of those of grazed.
- There is no significant difference in R_n values between grazed and ungrazed site.
- Turbulent flux values of ungrazed site are higher than those of grazed.

This is probably because the less quantity of vegetation and trampling by grazing result in less ability to store up heat in soil.

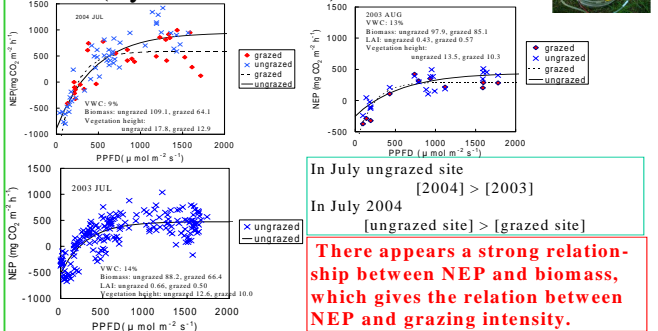
NEP (by flux stations)



There is no significant difference in the NEP values between grazed and ungrazed site

The difference between two sites appears significant

NEP (by CD method)



In July ungrazed site [2004] > [2003]

In July 2004 [ungrazed site] > [grazed site]

There appears a strong relationship between NEP and biomass, which gives the relation between NEP and grazing intensity.

Summary

- Grazing activity appears to control biomass.
- G values of ungrazed site are about half of those of grazed, because the less quantity of vegetation and trampling by grazing result in less ability to store up heat in soil.
- There appears a strong relationship between NEP and biomass, which gives the relation between NEP and grazing intensity.