



Changes in the abundance of C3/C4 species of Inner Mongolia grassland: evidence from isotopic composition of soil and vegetation

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Global warming, increasing CO₂ concentration and environmental disturbances affect grassland communities throughout the world. Here we report on variation in the C3/C4 pattern of Inner Mongolian grassland derived from soil and vegetation. Soil samples from 149 sites covering an area of approximately 250000 km² within Inner Mongolia, P.R. China were analyzed for the isotopic composition ($\delta^{13}\text{C}$) of soil organic carbon (SOC). The large contrast in $\delta^{13}\text{C}$ between C3 and C4 plants of approximately 14‰ allowed for calculation of the C3/C4 ratio from $\delta^{13}\text{C}$ of SOC with a two-member mixing model, which was refined by accounting for influences of aridity and altitude on $\delta^{13}\text{C}$ of the C3 end-member and for the terrestrial Suess effect. Finally maps were created geostatistically. They showed a substantial increase in C4 abundance in recent vegetation (by about 10%). The increase varied regionally and was most pronounced within an E-W belt along 44°N and in a mountainous area indicating a spread of C4 plants to northern latitudes (about 1°) and to higher altitudes. The areas of high C4 abundance could be well delineated for present vegetation and for SOC by the isotherms of crossover temperature based on the climatic conditions of the respective time periods. This study indicates a rapid change in plant community on a regional scale. Increasing temperature promoting C4 species override the C3 fostering rise of CO₂ concentration in Inner Mongolia grassland.