



Carbon dynamics and their responses to environmental drivers of desert steppe Inner Mongolia, China

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The arid and semi-arid ecosystems plays an important role in the terrestrial carbon cycle, but the dynamics of the carbon cycle are not clear while climate changes. Based on the TECO-R model for desert steppe, we estimate one of the most sensitive grassland types in arid and semi-arid ecosystems, desert steppe, Inner Mongolia, with its magnitude, distribution and dynamics of different carbon pools from 2000 to 2017, and the relationship between its changes with environmental factors. The results showed that the average carbon density of ecosystem was 2.51 kg C per square meter, of which the soil accounted for 91.8%. The carbon storage was significantly different among different vegetation biomes, the grassland dominated biome was higher than the shrubland biome, which were 2.85 and 2.19 kg C per square meter, respectively. During the period of study, the carbon sequestration with an annual average of 3.09 Tg C per year. Among the environmentally influencing factors of carbon dynamics, precipitation is the most significant control factor, while temperature has an opposite effect on carbon sequestration, especially for soil carbon pools. The temperature of whole region was widely increased, but the average annual precipitation was relatively stable, making the drought a major limiting factor for the increase of carbon sink capacity in the region. However, in the non-growth season, the precipitation and the temperature were increasing at 0.27 mm per year and 0.055 °C per year respectively, the tendency weakens the negative effects of increased temperature and drought in the growing season on carbon sequestration, and is a major natural contributor to the stabilization of carbon sinks in the desert steppe.