Geophysical Research Abstracts, Vol. 8, 10252, 2006
SRef-ID: 1607-7962/gra/EGU06-A-10252

Changes in physical and micromorphological properties of desert soils in Mongolia induced by the increasing aridity of climate

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Deserts are spread over 1/3 of the territory of Mongolia, and they tend to expand owing to both natural and anthropogenic climate change: climatic desertification was recorded to move into the steppe zone by 100 km during the last 10 years (Zolotokrylin, 2005). The plant cover is the most sensitive indicator of such events, and its modifications may be either reversible or irreversible. Soils – more conservative landscape components – are mirrors of the longer lasting phenomena.

The purpose of this research was to reveal those soil properties that result of increasing aridization of climate, and indicate the global changes. The micromorphological features of automorphic full-profile soils in the subzones (extremely arid, true and steppe-like) of the desert zone were the **study objects**. They differ in climatic conditions, plant communities, and occur on diluvium or proluvium. The application of the micromorphological method to the analysis of pedogenesis in deserts is explained by its high information capacity and scarcity of data on the world desert soils.

Results. The profile morphological, analytical and micromorphological analysis enabled us to assess the relative intensity of elementary pedogenic processes (EPP); soil physical properties have been compared to chemical and micromorphological ones. Thus, with increasing aridity, such aridic features as desert varnish, crusty and subcrusty horizons (vesicular porosity of the upper and microstratification of the lower horizons), surficial accumulation of wind-transported salts, and the biogenic mobilization of iron become more advanced. Stronger cementation of the crusty horizon and increase in the proportion of closed pores under more arid environments is in good agreement with the decrease of water permeability from 0.25 to 0.02 mm/min;

moreover, the density goes down (1.56-1.59 to 1.46 g/cm^3) unlike the total porosity (39-42 to 45%), which increases at the expense of rounded isolated voids (10-25 to 90% of the total porosity). The phenomena observed may serve as additional reasons of desertification owing to the feedback effects of the decrease in water permeability, hence, water reserves in the soils, lower water supply of plants against the background of lesser and more irregular precipitation, transfer of the potentially productive moisture into the surface runoff.

This study was supported by the Russian Foundation for Basic Research, project no. 05-04-49098.