

Structure of southern taiga landscape in border zone of Wurm glaciation

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The purpose of the regional geographical analysis is description of mechanisms of forming spatial structure and conditions of landscapes, their appearance and evolution. The analysis should renew them semantic complete pattern and should determine uncertainty areas of logical or formal model. Analysis should also determine the reason of uncertainty - lack of information, inadequate models. Classic example is existence of two models of moraine sediments - glacial and marine, and, within glacial model, uncertainty regard to stages and borders of each glacial epoch in time and space. Detection of uncertainty area in current models of structure, genesis, functioning of landscapes is the basis for task-oriented researches.

The involved region (Valdai Hill, Central Forest Biosphere Reserve (CFR established at 1931), 32.75°-33.13° E, 56.38°-56.58° N) is located on late Wurm glaciations border. Till now uncertainty concerning border of glacier in this place is kept. There are bases to draw it both to the north and to the south from CFR area. The same uncertainty is with genesis here of dust loam cover, of southern taiga ecosystems, of pale sod-podzol soils etc. United use of modern sources of spatial data (DEM, remote sensing data) with traditional field observations (more then 1000 point description of vegetation, soil and sediments) help us decrease uncertainty and to formulate new problems of landscape research. The maps of structure, genesis and functioning of a landscape cover of territory have been constructed.

Spectral analysis of DEM show that pre-quadernary relief organized by principle of multi scale blocks (3-100 km) which inserted one to another. General border of wurm glacier was determined by blocks edges with size 66-100 km. Sub-latitude edges of blocks determined frontal moraine sedimentation of penultimate and last glacial covers. Sub-longitude edges determined accumulation of medial moraine ridges (1-5 km). Borders between smaller blocks locate erosion network and determine configuration of hierarchical lineament landscape structures. Structures of a relief and sediment of the smaller order (10-1000 m) are defined by features of glacial cover deglaciation. These structures supervise spatial redistribution of moisture and characterized by special soil and vegetation types which were decoded on the basis of the remote sensing data with accuracy of 30-70%. Modern natural evolution of geosystems is determined by processes of bogging, windfall, development of eluvial and illuvial soil horizons.

The general features of functioning of landscape on the basis of a positive feedback contour was established on the basis of field and remote measurements of energy balance: transpiration of spruce forest increase - temperature decrease - peat-podzol soils forming - spruce trees optimum - transpiration increase. It supports the landscape system in southern taiga mode on general background of zonal mixed forests. Cutting and changing of spruce forests to small-leaved forest will lead to damage of this system and transformation of landscape to the mode of surrounding territories.

Unique features of the CFR nature allow investigating versatile questions of fundamental and applied character: formation of structure of a landscape and modern processes of its transformation, identification of geosystem formative factors, a role of territory in regional and global carbon cycle (eddy-correlation measurements), an estimation of ecological services and optimization of nature management in adjoining territories.

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