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Vegetation pattern dynamics in Northern Euro-Asia under the climate change

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Improper predictability of the climate change consequences and insufficient knowledge on principles of vegetation distribution over the Earth surface in dependence on climate initiate problems in reliable forecasting these changes. Together with static bio-geographic schemes, dynamic global vegetation models are widely used allowing to study both final states and transient dynamics of the vegetation cover under the climate change and human perturbations. Our research is based on the local probability scheme of interaction between three generalized vegetation states: multi-age forest, grass and desert. Each of them covers its own fraction in each spatial unit of the Earth surface at the given time moment. For these fractions the dynamic system is designed taking into account competition between forest and grass, intra-specific competition of forest and grass-desert interaction. The model has steady states corresponding to pure desert, grass, forest and several mixed vegetation covers in the unit. Stability boundaries acquire the particular form with linking competition coefficients to the climatic parameters – average temperature and annual precipitation – by means of the Lieth diagram and data on natural habitats of the most important forest species in the Northern Euro-Asia. One of mixed types looses its stability either due to a covering of the whole unit by only one vegetation type or through the oscillatory bifurcation. Oscillatory dynamic regimes appearing at the boundary reflects biological conception of cyclic forest stand reproduction. Any explicit climate scenario as a sequence of temperature – precipitation values, generates dynamics of the vegetation cover as a spatial mosaic with initial distribution calculated for the modern climate in Northern Euro-Asia. Using scenarios generated by some climatic models and based on A2

and B1 carbon emission scenarios by IPCC, we estimate the vegetation dynamics for Northern Euro-Asia over 120-year time interval and pay attention to the evolution of regions with transient dynamics.

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