Global synchronizing processes in the dynamics of terrestrial ecosystems in northern hemisphere

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In profoundly studied areas of northern hemisphere the latitude dependent population features for indicative species of small mammals population density dynamics are considered. Among other questions, the enigma of the vole and lemming cycles remains one of the largest unsolved - and most important issues within the field of population ecology.

The population properties in question are as follows: regular multiannual cyclic fluctuations in local species abundance, geographical synchrony and large space correlations, the latitude gradients of population parameters etc. The analysis presented suggests the involvement of exogenous global processes which, seemingly, takes part in formation of the specific local patterns in long-term dynamics of northern ecosystems. The degree of suggested influence appears to be of patched, latitude dependent structure which capable to modulate the intra species behavior in a wide dynamic band: form stochastic one to regular stable limit cycles.

The expected solar effects via so called heliogeophysical factors on living systems might depend on their current state and properties. In terms of nonlinear dynamic systems it is postulated that the effects may be not significant for definite rough type systems and vice versa. Furthermore, the registered bio response and it phenomenological appearance depend on the moment and conditions of its implementation. If the systems unstable, at least some kinds of infinitesimal perturbations cause the system to leave the immediate neighborhood of the steady state and move to another region of composition state. Such evolution may be accompanied by temporal order of τ-diversity, as a dynamic kind of biodiversity. If a system is initially in a steady state, a necessary (but often not sufficient) condition for ordered behavior is that the steady state is unstable. The subarctic ecosystems are more capable to such evolution due to specific and unique variety of abiotic multifactor environment.