

Large-scale energetic and landscape factors of vegetation diversity

We show that at large scale the species number of vascular plants can be predicted to a major extent by climatically determined latent heat for evaporation and geometrical structure of landscape, described as an altitudinal difference. Application of the energy-equivalence rule across plant communities for transpiration per area unit, and use of fractal theory for the description of habitat occupation by vegetation results in a physically based species–energy relationship. Application of averaged global constants in the relationship results in a species–area equation with known parameters. Despite its simple form, this species–energy relationship generally reproduces global patterns of vegetation diversity at two scales – 10 000 and 100 000 km²– and is applicable for different regions across scales from 100 to million km². The proposed theory produces more robust results compared with the correlated-based approaches, which link plant diversity patterns with climate variables, and allows the inclusion of an evolutionary component. The final climate–richness equation for vascular plants has a simple and consistent analytical form and requires easily measurable variables.