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Using multispectral and hyperspectral satellite imagery in ecological and geographical studies

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Multi and hyperspectral measurements have been suggested as the method to assess the state of ecosystems. Two approaches were considered: without and with the use of field data. In the first case, the calculation of the thermodynamic variables (absorption of solar energy, Kullback information, the entropy of the reflected solar radiation, exergy) of the system, using the solar constant as reference, is used. Types of thermodynamic states of the system were estimated by dichotomous cluster analysis. Such states are usually well associated with known types of vegetation. The same cluster analysis is used on initial measurements of the spectral reflection with selection of the best metrics based on the principle of maximum entropy. This approach allows to differentiate the ecosystem with different forms of solar energy usage and different functioning and also to assess the ecosystems organization. The second approach is based on a regular step measurements along the transects. All points of transects were merged with spatially corresponding thermodynamic and reflectance variables for a different dates of a year. Multidimensional analysis was used to determine the systemic linkages between state of vegetation and soils on one hand, and thermodynamic and reflectance variables on the other hand. As a results, informativity of remote measurements, its seasonal dynamic and physical basis were obtained, also the factors determining the solar energy usage, and ecosystems maps based on state of ecosystem, which are most connected with the solar energy conversion, were obtained.

Biography

Mikhail Yu. Puzachenko has completed his PhD from the Institute of Geography RAS and Post-doctoral studies from Institute of Geography RAS. He is the Senior Researcher in Physical Geography and Environmental Management Department. He has published more than 30 papers in peer reviewed journals and has been a member of more than 15 national and international science projects.

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