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LAND MANAGEMENT, CADASTRE AND LAND MONITORING

OPTICS, OPTICAL AND ELECTRONIC DEVICES AND COMPLEXES

ECOLOGY AND ENVIRONMENTAL MANAGEMENT

GEODYNAMIC SYSTEM (KINEMATIC AND DEFORMATION MODEL OF BLOCK MOVEMENTS)

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Geodynamic system that there are objects, processes, phenomena in terms of territory are the global (planetary), regional and local. The last may include engineering geodynamics, consisting of two subsystems - engineering structures and geophysical (physical and geological) environment. The study of geodynamic objects and processes is not only topical scientific and practical problem. This applies, for example, to the areas of mining, large hydro-technical facilities, engineering facilities, etc. The most important characteristic of geodynamic objects is their stress-strain state, since at some critical stress values may be a sharp change in the object structure, properties, etc., causing unwanted and even disastrous for the consequences. The study of geodynamic objects and processes should be based on serious theoretical research, the main content of which is a simulation of movements and fields of deformations and stresses taking into account discontinuities and heterogeneities in the earth's crust.

The article gives an overview of the most currently used kinematic and deformation models of block movements and algorithms of their receipt in the survey data. Marked visual and informative visualization of displacements and deformations on discrete data on the movements of the points. The use of thematic maps and GIS improve the possibilities for the operative decision of problems of the forecast, reduce risk, and reduce the effects of geodynamic catastrophes of natural and technogenic character.

Key words: geodynamic system, stress-strain state, kinematic and deformation models, visualization of displacements and deformations.

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IMPLEMENTATION OF A GEOCENTRIC TERRESTRIAL REFERENCE FRAME FOR THE TERRITORY OF RUSSIA AND BORDERING COUNTRIES

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The article describes an experimental estimation of coordinates and velocities of reference points of the Russian fundamental astro-geodetic network and the International GNSS Service tracking network using Bernese GNSS software 5.2. As a result of the experiment a new implementation of geocentric reference frame was obtained. Transformation parameters from the new reference frame to GSC-2011, PZ-90.11, ITRF2008, ITRF2014, WGS84, SC-95 and other reference frames were calculated. According to the results of accuracy evaluation the standard deviations of residuals of transformation from the new data set representing a new reference frame to ITRF2014 were 4 mm along X axis, 3 mm along Y axis, 8 mm along Z axis. The obtained results are to be used for development of a highly accurate and precise reference frame which shall include all available continuously operating reference stations in the territory of Russia.

Key words: Positioning, Navigation, Timing, terrestrial reference frame, reference system, Global Navigation Satellite Systems, Continuously Operating Reference Stations, geodetic network, adjustment.

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THE DEVELOPMENT OF A SPECIAL VARIANT OF THE PROJECTION GAUSS – KRÜGER ENGINEERING FOR URBAN SURVEYING IN KYRGYZSTAN

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For geodetic engineering and city works the most important is the minimum distortion of distances and reductions of areas, in contrast to the classical basic geodetic works. And currently this quality is important in the creation of state and regional networks modern methods of GNSS. Forced to harmonize national geodetic engineering, and especially the city was the development of the different applications, coordinate systems Gauss-Krüger in the form of "private began", "private "meridians" of the various "compensatory" systems, etc. They remained outwardly conventional application circuit of the projection and coordinate system Gauss-Krüger, but it was still a retreat from it. Lately for thickening of geodetic networks in Kyrgyzstan specialists offers many different methods of its creation.

In this scientific article describes a special variant of the projection Gauss-Krüger for design engineering and surveying of the Kyrgyzstan and method of constructing geodetic networks (triangulation, traverse, trilateration, and their combinations, and satellite technologies) for urban conditions.

Key words: distortion, conformal proection, cutting plane, system of coordinates, special-purpose geodetic network.

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TESTING METHODS OF INTEGRATION REGIONAL CORS NETWORK AND THE RUSSIAN STATE GEODETIC NETWORK

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Increase accuracy of national coordinate system GCS-2011 is directly concerned with the state geodetic network (SGN) development as physical carrier coordinate system. Density of permanent station the fundamental astronomical and geodetic network (FAGN) as a part of Geodetic reference networks (GRN) isn't enough for effective geodetic support Russian users. Inclusion in GRN structure independent continuously operating reference stations (CORS), which were widely adopted in the Russian Federation, could solve this problem. This new GRN structure is focused on the implementation of advanced methods of surveying and formation of a unified high-accuracy reference frame accessible to consumers.

The article presents some results of adjustment FAGN and regional CORS network stations. This adjustment is a practical step towards formation of new structure GRN in Novosibirsk region.

Key words: Global Navigation Satellite Systems, state geodetic network, fundamental astronomical and geodetic network, Continuously Operating Reference Stations, Geodetic reference networks, unified high-accuracy reference frame, consolidated adjustment.

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COMPARISON OF METHODS FOR THE DETECTION OF FOREST BURNT AREAS ON OPTICAL AND RADAR SPACE IMAGERY

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The traditional approach to ecological-economic assessment of consequences of forest fires, which is currently at the expert level when it is exactly known, the size of a burnt forest is not focused on the operational definition of the extent of forest fires and assessment of their possible consequences immediately after discovering the fire. Therefore, this approach does not allow to make timely decisions on the management activities of forest protection services. For the operational environmental and economic assessment of possible consequences of a forest fire involves the use of satellite imagery, allowing to solve these tasks with a high degree of efficiency and with a large area of coverage that is most important for hard to reach areas of the forest regions of Siberia.

The article comparison of methods for the detection of forest burnt areas in optical and radar imagery. It is concluded that objective detection of forest burnt areas using radar images is solved by the synthesis of a color image from a set of multi-temporal radar imagery.

Key words: forest resources, ecological and economic assessment, satellite images, optical and radar images.

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INVESTIGATION AND ALGORITMS FOR SOLVING DIAPHANTINE PROBLEMS VIEW, $\frac{4}{k} = \frac{1}{x} + \frac{1}{y} + \frac{1}{z}$, FORMULITE ERDOS

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The work is devoted to solving non-trivial way to calculate the latitude and radius of curvature of the Earth to the space coordinates and the theory and practice of a second-order problem that has formulated P. Erdos in geodetic works. A general algorithm for finding natural solutions of Diophantine problems, justify the existence of these decisions on the sets $\{4q\}$, $\{4q+1\}$, $\{4q+2\}$ and $\{4q+3\}$. Provides additional information on the hypothesis Erdos-Strauss. In this paper, the problem is solved on the sets $\{4q\}$ and $\{4q+2\}$, where the parameters x, y and z are numerical functions, and it is shown that the problem is always the natural solution for a fixed number of $n>1$.

Key words: diophantine equation, the hypothesis Erdos, integers, the integer part of the functions of the second kind of function gap.

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THE DEFINITION OF RELATIVISTIC LEVEL SURFACE OF AXE-SYMMETRICAL EARTH'S MODEL IN ROTATING WITH THE EARTH COORFINATE SYSTEM

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The article represents the basic theoretical and methodological base of cadastral cost calculation of land parcels on the main types of legitimate use on the basis of modeling social and economical potential of such land parcels with the use of measurement theory and astrogeophysical space (AGPS) estimation. The modeling base – exponent function, universal space measurement unit – square radian, polar coordinate, market conditions of estimation objects and their types of legitimate use. The article suggests general model of random AGPS point and gives methodological recommendation of its application depending on cost forming factors of estimated objects. There is a practical example of the suggested calculation method, containing calculated statistic model of cadastre value estimation of land parcels for individual housing construction in country settlements of Buryatiya Republic, value parameters of such model, determining the impact of main cost forming factors, among which are the position of object, the distance from basic life-support centres, transport availability, the own infrastructure etc. The article makes conclusions about possible industrial application of the method, in the frame of specialized cadastre estimation centre.

Key words: land parcel, type of legitimate use, cost forming factor, cadastral cost, social and economical potential, additional cadastral information, cadastral estimation centre

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COMPARISON OF THE COMMERCIAL SOFTWARE PERFORMANCE OF GNSS KINEMATIC MEASUREMENT POSTPROCESSING FOR AERIAL GEOPHYSICS GEODETIC SUPPORT

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In the article the comparison of the performance of different softwares for GNSS Post Processing in relative kinematic mode is given. The data for the test that's used in the article were taken from aerial geophysical works by dual-frequency GPS/GLONASS receivers with less than 1 second data recording period. The contemprorary GNSS postprocessing programms that were compared in article were: Topcon Tools, WayPoint GrafNav, Magnet Office Tools, Leica Geo Office, Justin и Trimble Business Center. Results of postprocessing by every sofware were compared with the others for each measured epoch. Statistical analysis of differences in plane coordinates and ellipsoidal heights is showed in article. Conclusions and recommendations are given.

Key words: GNSS, kinematic measurements, postprocessing, aerial geophysics, software, grafnav, justin, magnet tools, topcon tools, trimble bc.

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GEOPORTALS AS A BASIC ELEMENTS OF SPATIAL DATA INFRASTRUCTURE: ANALYSIS OF CURRENT STATUS OF THE ISSUE IN RUSSIA

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This article considers the current situation in the field of design for geoportals in Russia.The article provides historical background on the topic of the first experience of creating geoportals. After that, the analysis of the current situation in this area of our country. Citing the example of some of the existing geoportals and geoservices federal and regional levels for the use of a wide range of users and to work in the scientific and academic sphere. On this basis, an analysis to identify key existing institutional, scientific and technical issues in the implementation of the national spatial data infrastructure and development geoportals as access points to spatial information. Also, the article discusses possible solutions to the problems identified.

Key words: geoportal, geoservise, spatial data infrastructure, geodata, spatial information, metadata.

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THE DEFINITION OF NORMS OF LAND PARCELS RATIONAL USE ON THE BASES OF MODELLING THEIR ECONOMIC POTENTIAL

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The article represents the basic theoretical and methodological base of cadastral cost calculation of land parcels on the main types of legitimate use on the basis of modeling social and economical potential of such land parcels with the use of measurement theory and astrogeophysical space (AGPS) estimation. The modeling base – exponent function, universal space measurement unit – square radian, polar coordinate, market conditions of estimation objects and their types of legitimate use. The article suggests general model of random AGPS point and gives methodological recommendation of its application depending on cost forming factors of estimated objects. There is a practical example of the suggested calculation method, containing calculated statistic model of cadastre value estimation of land parcels for individual housing construction in country settlements of Buryatiya Republic, value parameters of such model, determining the impact of main cost forming factors, among which are the position of object, the distance from basic life-support centres, transport availability, the own infrastructure etc. The article makes conclusions about possible industrial application of the method, in the frame of specialized cadastre estimation centre.

Key words: land parcel, type of legitimate use, cost forming factor, cadastral cost, social and economical potential, additional cadastral information, cadastral estimation centre.

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METHODICAL AND TECHNOLOGICAL SUPPORT OF EFFICIENT LAND MANAGMENT IN HYDROCARBON EXTRACTION CONSIDERING REGIONAL FEATURES OF THE FAR NORTH

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The article presents research materials for the development and implementation of environmentally-oriented land management technologies for the oil and gas companies on the Far North. The necessity of the application of these technologies to save nature resource potential of the territory and traditional lifestyle of small indigenous population was proved. The classification of the destruction of land and vegetation during the development of oil and gas field was developed. The conclusion about the land areas and about the level of land and vegetation destruction of oil and gas field was made. The received data confirm the irrational use of land resources and large, more than 15 % of territory of destructed vegetation. As a result, the environmental risks, associated with land, are appeared. The article describes the environmental risks. Based on the analysis of the level of land destruction and environmental risks, the criteria of optimal land management accounting regional features of the Far North were proposed. These optimal criteria are the one of essential elements of the developed method of rational land management of oil and gas industry. The proposed technical decisions to minimize the environmental impacts of the hydrocarbon development are presented, particularly, as the technology of environmentally-oriented land management applying of new technical decisions to develop the allotment of land to construct the oil and gas facility.

Key words: land pollution, environmentally-focused oil and gas technologies, oil and gas, environmental risks, land management, Far North regional features.

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APPLICATION OF «GIS-INVESTOR» SYSTEM FOR MUNICIPAL LAND RESOURCE MANAGEMENT

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One of the most important challenges, facing public authorities and local governments, is the creation of favorable conditions for economic growth and improvement of the population's life quality. Geoportal technologies are one of the advanced tools for operational decision-making at all levels of the in-country management. After all, geoinformation is the basis for efficient territory management. The article presents the designed investment portal "GIS investor for Novosibirsk", describes its technologies and features important to investors. Under the development of the portal, investment opportunities of the region, its IT-infrastructure and wish of the authorities to make the region one of the most attractive for investment among other regions of the Russian Federation were taken into consideration.

Key words: GIS-investor, geoportal, geoportal technologies, geoinformation, ISD, web portal, geospatial data, land resources, investments, real property, real estate market.

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FEATURES OF CADASTRAL REGISTRATION MULTI-LOOP LAND

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According to Art. 11.9 of the Land Code, land must not cross the boundaries of municipalities, towns and regional areas. However, in the Russian Federation border are different kinds of objects, area or length of which violate the specified requirements of the Land Code. Such land formerly known as uniform land use, but at the moment they got a new name - multiloop land.

According to the requirements of Russian legislation and the order of the Ministry of Economic Development number 412 for each land boundary plan prepared by one. However, such land, as a rule, are located within the boundaries of one cadastral quarter. However, compliance with this requirement is impossible for state cadastral registration of land plots occupied by areal or linear objects of considerable size.

Addressing topographic surveys of the above objects, according to the order of the Ministry of economic development of the number 144, is carried out in the conventional cadastral quarter, the boundaries of which may coincide with the boundaries of several cadastral districts or cadastral districts. The process of preparation of survey plans for the said land is identified with the process of formation of survey plans in the conventional plots.

This article provides the rationale for the preparation of materials for state cadastral registration of land plots meshed in each subject of the federation, because for one cadastral engineer is almost impossible. In addition, in each subject of the Federation established its own system of coordinates, which requires additional work on the docking facility in the areas of overlap.

Key words: land, common land, multicontour land adjacent to land, cadastral registration, methods for the formation of land cadastral works, survey plans.

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METHOD OF ECONOMIC EFFECTIVENESS OF TERRESTRIAL PLANNING (ON THE EXAMPLE OF NOVOSIBIRSK REGION)

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The relevance of the publication of topics dictated by the fact that in the new conditions of urban development since 2004 on the effectiveness of territorial planning began to reflect in 2013 after the adoption of guidelines for the development schemes. Therefore eLIBRARY.RU (RISC) No registered publications about the economic efficiency of land use planning. Construction is economically costly, ie beyond the design and necessary as the biogeochemical activity. To assess the grounded materials and methods, results of analysis and discussion. An example of the analysis of the effectiveness of territorial planning in the Novosibirsk region. Founded conclusions about the role of spatial planning in order to overcome geographical determinism and the construction of ecological framework on the basis of land-use categories. Social frame is possible in each individual area, and the entire territory of the Federation, without isolation of other levels of government - economic framework.

Key words: scheme of territorial planning, cost efficiency, section, framework, territorial subject of the federation, budget, quality of habitat, geographical determinism.

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THE REGISTRATION METHOD OF REAL ESTATE OBJECTS HAVING LOST THE CIVIL DEFENSE CONSTRUCTION STATUS

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The topic of the article is considered by a number of authors. There are not so many authors who deal with questions of civil defense construction cadastre. The retirement of defense construction is a long, cost- and labour-consuming process. It includes the work of a big number of institutions, organizations and specialists. The article considers the retirement method of civil defense constructions. The method represents consequently changing steps. The article describes and considers the documents required on each step. The main document, which is the base of retirement process of defense construction is the Instruction of State Committee of the Russian Federation on State Real Estate Management November 5 1996 № АР-13/7746. The retirement method of civil defense constructions is presented in the view of scheme, designed by the author. The scheme is applicable to the work of specialists and can be used as a manual for treating newcomers.

Key words: lands of industry and other special purpose, civil defense constructions, civil defense constructions inventory, real estate cadastre of special purpose lands.

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OF SOME RESULTS OF DATA VERIFICATION OBTAINED IN INTEGRATION PROCESS OF STATE CADASTRE AND UNIFIED STATE REGISTER OF RIGHTS ON REAL ESTATE AND DEALS WITH IT AND THEIR USE FOR TAXATION PURPOSES

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The work represents the analysis of verification procedure of data, obtained in the process of integration of State Real Estate Cadastre and United State Register of rights on real estate and real estate business, downloaded into information database of tax authority, in the process of interaction between Rosreestr and Federal Tax Service of the Russian Federation in fulfillment of tax policy, provided on the territory of the Russian Federation, with notification of main mistakes occurred in mentioned procedure. Taking into account the experience of foreign states in state policy in the sphere of real estate rights registration, with further calculation and levying of real estate taxes, were prepared the proposals for simplifying the mentioned procedures, with making corresponding changes in legal acts of the Russian Federation.

Key words: real estate, real estate registration, verification, format-logical control, taxes, revising entry, territorial information resource, federal information resource.

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v sfere gosudarstvennoy registratsii prav na nedvizhimost' i gosudarstvennogo kadastrovogo ucheta nedvizhimosti i plana realizatsii meropriyatiy po sozdaniyu edinoy federal'noy sistemy v sfere gosudarstvennoy registratsii prav na nedvizhimost' i gosudarstvennogo kadastrovogo ucheta nedvizhimosti [The concept of a unified federal system in the sphere of state registration of rights to real estate and state cadastral registration of real estate, the plan of preparation of draft regulations to ensure the creation and development of a unified federal system in the sphere of state registration of rights to real estate and state cadastral registration of real estate and plan the implementation of activities to create a unified federal system in the sphere of state registration of rights to real estate and state cadastral registration of real estate]. Retrieved from Garant online database [in Russian].

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DEFINITION CRACK RESISTANCE CHARACTERISTICS OF DETAILS OF OPTICS-MECHANICAL INSTRUMENTS

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The aim of traditional tests of samples with initial incisions is to make a diagram *"P-V"* (*P* is force stretching the sample & *V* characterizes the widening of the crack), on which a characteristic point *Q* is fixed, defining the beginning of crack growth. By force P_Q, corresponding point *Q*, the characteristics of static crack resistance are calculated. At brittle (elastic) destruction we get diagram, having the maximum or the local loading maximum around the characteristic point *Q*. In such cases this point is fixed precisely enough, & the characteristics of crack resistance are defined with a great degree of reliability. At plastic & elastic-plastic destruction we get diagram, where the point *Q* is defined through building a 5 % secant. As many investigators point out, such method may cause considerable error when calculating the characteristics of crack resistance, as the peculiarities of the tested metals are not taken into account.

This problem is solving be building of empiric diagram *"P-*ΔT*"*, where ΔT is increment of the temperature at the top of the crack during a certain short period of time. This diagram, unlike traditional diagram *"P-V"*, makes it possible to record with more precision the distinctive point

Q, defining the beginning of crack growth, because in that time the process of plastic deformation on top of the crack begins. Then an intensive dispersion of heart occurs & temperature curve has a characteristic bending. This bending having a distinct physical interpretation is reliably fixed by standard equipment used for measuring the temperature without a contact.

The point *Q* is recorded especially clearly by properly step on the diagram *"P-ΔS"*, which is built on the basis *"P-ΔT"* diagram. The statistics analysis of the crack resistance characteristics, obtained by a traditional method & by the proposed thermographic method, demonstrated that in the latter case these characteristics are defined more precisely.

Key words: crack resistance, stress intensity factor, temperature, entropy, specified load, incision, cut, crack motion.

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THE USE OF MUSCA DOMESTICA LARVAE-BASED ZOOHUMUS AS OIL PRODUCTS SORPTION

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A new method of using Musca Domestica larvae-based zoohumus as a sorbent for water purification from oil products has been proposed. Experimental study of sorption properties of zoohumus were carried out on model solutions saturated with oil products. The initial concentration of diesel fuel and motor oil in water were 29.0 and 16.8 mg/dm^3, respectively. Adsorption isotherms of motor oil and diesel fuel by zoohumus were built on the results of the work. Analysis of the isotherms showed that zoohumus has a positive adsorption activity in relation to the studied oil products. Experimentally obtained adsorption isotherms of diesel fuel and motor oil have been modeled using the classical empirical Langmuir-Freundlich equations. Linear forms of the isotherms allow to obtain the constant parameters of Langmuir-Freundlich equations. The value of accurate approximation was obtained for each of the presented dependencies after processing. The article shows that zoohumus has the higher sorption activity in relation to diesel fuel compared to engine oil.

Key words: oil products, sorption, zoohumus, purification.

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CONTINUOUS SPATIAL MODELING OF RICHNESS AND OCCURRENCE OF PLANTS USING REMOTE SPECTRAL DATA (NORTHERN TAIGA OF WESTERN SIBERIA)

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The features of continuous spatial modeling of two main characteristics of vegetation – richness (% of cover) and occurrence of species, based on statistical relations with spectral values of space-born image (Landsat) are considered. The simplest version of statistical model, ordinary linear regression was used in all cases. Two approaches of modeling were applied: direct models (regression of observed values of vegetation and spectral values) and models with the use of factors of vegetation variability (regression of factors and spectral values, then modeling vegetation values). Models were estimated by coefficient of determination for observed and predicted values including cross-validation as measure of stability. Different versions of models showed that modeling of richness is limited by several dominating species

with big range of richness. Modeling of occurrence was better for big portion of species. Direct models appeared less stable than models that used factors of complex variability both richness and probability of occurrence.

Key words: statistical modeling, vegetation, remote sensing data.

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