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#### **UDC 627.43**

**4.C1.6. Several issues regarding research of arch dams under operation.** /A.Tchrelashvili/. Energy. – 2008. – #4(48). – pp. 76-79. – Geo. (res. Geo., Eng., Rus.)

The article deals with handling of an important problem occurred in the body of Enguri arch dam under operation as a result of the known anomalous phenomenon. When the reasons of its occurrence are not known, the searching of ways and means of solving the above-mentioned problem is essentially complicated. An original approach by using a method of imposition of fictitious, orthotropic systems is suggested. As additional sought quantities values (other than those presented in the method of imposition of fictitious, orthotropic systems) modules of deformation of the base of Enguri arch dam presented in the form of double mathematical lines have been introduced. For the purpose of determining unknown coefficients in desired quantities, additional equations are introduced that reflect the results obtained by carrying out full-scale observations in the base of Enguri arch dam.

#### **UDC 621.1**

**4.C1.7. Issues concerning modeling of optimization problems of developing of fuel-energy complex.** /M.Razmadze, O.Vezirishvili/. Energy. – 2008. – #4(48). – pp. 80-83. – Geo. (res. Geo., Eng., Rus.)

Issues concerning modeling of optimization problems of a fuel-energy complex are considered. The development of a fuel-energy complex shall become the decisive factor in determination of the energy policy of Georgia. Methods of conducting a financial and economic analysis for increasing energy efficiency are presented. Mathematical models for optimization of developing of a fuel-energy complex both for the whole as well as separate (unit) structures, which ensure solution of the development optimization problems at different stages of planning on the basis of available information have been worked out. Formulas that can compute a balanced interconnection of energy consumption and power and fuel supply to power industries and industrial regions and which are so important for developing a normal national economy are given.

#### **UDC 621.31**

**4.C1.8. Situation in the electric-power industry of Georgia.** /M.Loria/. Energy. – 2008. – #4(48). – pp. 109-112. – Geo. (res. Geo., Eng., Rus.)

A situation existing in the Georgian electric power sector is analyzed. In spite of the fact that Georgia is rich in its hydro resources, only 15% of them are used at present. In many foreign countries, most of hydro-resources have been used. Georgia lacks any other energy resources (oil, gas) and an emphasis must be made on the maximum development of available hydro-resources. The total capacity and output of hydropower stations of Georgia are presented. It is pointed out that recently the generation of electric power in the country has increased, which denotes a growth of operating efficiency of hydro-power stations. Also a tendency of growth of economy as a whole is seen. Three distribution companies – JSC TELASI Energy Company KAKHETI and JSC ENERGY-PRO GEORGIA – operating on the domestic market are described. Observations regarding growth of the operating efficiency of the above-mentioned companies have been voiced.

#### **UDC 621.31**

**4.C1.9. Transit of power from Azerbaijan and Georgia to Turkey.** /A.Artilakva/. Energy. – 2008. – #4(48). – pp. 113-115. – Geo. (res. Geo., Eng., Rus.)

In the near future, a problem of transmission of power from Azerbaijan and Georgia to Turkey will be raised. For this purpose, it will be necessary to enhance a power supply network of Georgia by creating Akhaltsikhe center, where “Zestafoni-Akhaltsikhe” and “Akhaltsikhe-Gardabani” high-voltage lines will pass. By 2013-2015, electric-power generation in Georgia is to increase. 500 kV “Mukhrani” line will be reconstructed to combine power systems of Georgia and Azerbaijan. All this will enable to transfer to Turkey considerable power from the Akhaltsikhe center. Modeling of the grids of Georgia, Azerbaijan and Turkey was carried out by means of a program complex PSS/E. Models of the grids of Georgia and Azerbaijan are presented by a complete network. The Turkish side is presented by an equivalent scheme.

The most difficult moment for the system can be short circuits on the “Imereti” high voltage line. If a short circuit lasts for 0.3, the system stability will be disturbed.

#### **UDC 621.1.018.82**

##### **4.C1.10. Bench testing of a traverse dynamometer design by dynamometrical cut technique.**

/E.Zavrian/. Energy. – 2008. – #4(48). – pp. 116-118. – Geo. (Geo., Rus., Eng.)

Under specific conditions of static operation of concrete underground structures, an indirect method for a correct one. The latter fails to completely and accurately take into consideration some factors, connected with the operation of concrete and ferroconcrete structures. To determine the operating stresses in a tunnel lining, a ‘dynamometric cut’ method of bench testing of some objects has been introduced at the Yerevan Laboratory of Tunnels. Method of bench test of a traverse-type dynamometer is given. Tests are carried out on two types of patterns in eight concrete specimens sized 75x75x12 cm. The ready patterns of the device are mounted in vertical position under the press, with about 20 t-loading. The holes are drilled in the plates. As a results of drilling, loading on the dynamometer increases. The maximum value of loading measured by the dynamometers was obtained under completing H-type cut and the stress value made 0.74 on the average. The obtained results confirmed reliability of measurement by means of a dynamometrical cut

#### **UDC 625.93.001**

##### **622.693.24**

##### **4.C1.11. Main Oil and Gas Pipelines and Underground Gas Storages (Projecting, Constructing and Exploitation).**

/G. Varshalomidze, I. Gogvadze/. – 2009. – 651 p. – Geo., (res.: Geo., Rus., Eng.)  
The authors of this monograph have collected and given factual material, which contains complete information about all works related to the service of main oil and gas pipelines and underground gas storages. The connection of contemporary state of exploitation of equipment in the current geological, hydrogeological and ecological conditions with energy security both in Georgia and in the world is described. The object of special attention is a contemporary state of energy complexes in Georgia and the monitoring of their exploitation. The prospects of construction of new underground gas storage in the East and West Georgia, projecting new installations and creation of ecologically clean conditions for construction of energetic complexes in Georgia are considered

## **C2. Electrical Engineering. Electronics. Radio Engineering. Communications**

#### **UDC 621.377.622.322.3**

##### **4.C2.1. Transformers with amorphous-magnetic core.**

/Sh. Natchkebia, N.Gvaramadze/. Energy. - 2008. – #4(48). – pp.103-108. – Geo. (Geo., Rus., Eng.)  
For reducing transformer losses preference is given to power transformers in which amorphous materials are used. Such transformers have considerably smaller dimensions and weight against power transformers mounted on stations and substations of Georgian grid. The transformers made from amorphous materials are predominantly used in developed countries. Based on the above, replacement of the relevant equipment operating in the Georgian grid by modern transformers, made from amorphous materials becomes advisable. Prospects of using amorphous magnetic materials for manufacture of electric transformers are considered. Basically, a design of amorphous magnetic cores for transformers is covered. These are: magnetic properties, dimensions, capacity, standard curves, size of transmission capacity, magnetic losses, vibration frequency, etc. Features of cores made from nano- crystalline materials are studied.

## **C3. Automation & Telemetry. Computer Engineering**

#### **UDC 656.21**

##### **4.C3.1. Influence of faults of railway automatic and telecontrol devices on railway operating characteristics.**

/M.Gotsadze, N.Khuchua/. Transport and Machine Building. – 2008. – #3(11). – pp. 76-80. – Geo. (Geo., Rus., Eng.)  
Influence of faults of railway automatic and telecontrol devices on railway exploitation indexes is researched (fault of automatic section blocking equipment and fault of electric power interlocking devices on intermediate stations) are studied; relationship of a double-track line capacity loses to automatic interlocking signal equipment faults is viewed; shipment expenditures caused by faults of interval control equipment are calculated are calculated; it is shown that eradication of track circuits’ faults importantly increases operating characteristics of the railway.

## C4. Mining. Metallurgy. Chemical Industry

### UDC 553.43

#### 4.C4.1. Prospects of ecologically justified processing of Madneuli copper concentrate in Georgia.

/M.Berezhiani, A.Berejiani/. Proceedings of the Georgian National Academy of Sciences, Chemical series. – 2008. – vol. 34. – #2. – pp. 193-196. – Geo. (res. Eng., Rus.)

A scheme of virtually wasteless industrial complex development for copper concentrate processing is considered, where a technological and ecological barriers for separate plants turn into mutually beneficial links, in particular: sulfurous anhydride recovery from non-ferrous metallurgy effluent gas by effective ammoniac process lets to produce sulfurous anhydride as a marketable product that is used for nitrogen-15 stable isotope production. Finally, ammonium sulfate fertilizer is produced; the objectives of recycling waste acids and nitrous gases are fulfilled; and the capability for copper vitriol production is provided.

### UDC 542.973

#### 4.C4.2. Co-Mn catalysts on aluminum-calcium carrier for carbon conversion of methane.

/V.Mosidze, V.Bakhtadze, R.Janjgava, M.Pajishvili, N.Kharabadze/. Proceedings of the Georgian National Academy of Sciences, Chemical series. – 2008. – vol. 34. – #2. – pp. 210-213. – Rus. (res. Geo., Eng.)

It has been shown that at volume rate of methane –  $4000 \text{ h}^{-1}$ , at ratio  $\text{CH}_4:\text{CO}_2=1 \div 1,5$  and in the temperature range of  $750\text{-}900^\circ\text{C}$ , at carbon conversion of methane on Co-Mn catalysts on aluminum-calcium carrier, the converted gas of the following composition is produced, in vol. %:  $\text{H}_2$  – 43,0- 44,0;  $\text{CO}$  – 44,5-45,0;  $\text{CH}_4$  – 0,0;  $\text{CO}_2$  – 11,0-12,0. The 50-hour experiment duration does not show a carbon trace on the catalyst surface.

### UDC 621.643.053

#### 4.C4.3. Ways of raising resource of truck pipelines. /I.Berdzenishvili/. Proceedings of the Georgian National Academy of Sciences, Chemical series. – 2008. – vol. 34. - #2. – pp. 214-217. – Rus. (res. Geo., Eng.)

The efficiency of enamel protection of pipelines is shown. On the basis of manganese containing carbonate ore new highly effective protective enamel coatings for pipelines are synthesized. The technology of induction enameling of pipes is estimated.

### UDC 615.477.1

#### 4.C4.4. Polymer composition of orthopedic sole material. /M.Shalamberidze, Z.Kopadze, N.Lomtadze/. Proceedings of the Georgian National Academy of Sciences, Chemical series. – 2008. – vol. 34. - #2. – pp. 218-220. – Rus. (res. Geo., Eng.)

Physical and mechanical properties of butadiene-styrene polymer compositions on the basis of latent hardener (ЛО-3) and sulfur vulcanization agent have been studied. It is proved that the use of the latent hardener (ЛО-3) in butadiene-styrene rubber gives more flexible and soft sole material than in the case of sulfur vulcanizers of corresponding rubbers.

### UDC 669.3

#### 4.C4.5. Role of carbonic materials used during direct reduction of iron ore to metallic iron.

/N.Loladze, M.Tserodze, T.Pkhaladze, R.Tabidze/. Proceedings of the Georgian National Academy of Sciences, Chemical series. – 2008. – vol. 34. – #2. – pp. 225-228. – Rus. (res. Geo., Eng.)

The work is dedicated to the issues of direct reduction of iron ore to metallic iron using a solid carbonic reducing agent. The data on the possibility of applying the electro-contact method of heating the initial reaction charge are presented. Experimental data on the substantial influence of the structure and nature of the solid carbonic reducing agent on the efficiency of the reduction process are obtained. Optimal concentrations of various carbonic materials in the initial reaction charge in case of the application of electro-contact method of heating is identified.

## C5. Mechanical Engineering. Instrument-making

### UDC 539.32

#### 4.C5.1. Ultrasound instrument for determining a module of elasticity of concrete directly in a structure. /P.Tchitchagua, T.Jojua, T.Turmanidze, G.Putkaradze/. Energy. – 2008. – #4(48). – pp. 99-102. – Geo. (res. Geo., Eng., Rus.)

To determine a stressed-strained state of buildings and structures, it is necessary to know a module of elasticity of concrete as the initial data. In most cases, its size is determined by testing of standard samples under laboratory conditions. Numerous tests indicate that such identification of the size of the module of elasticity of concrete is considerably different from the module of elasticity of concrete of a full-scale construction. A module of elasticity of mass concrete is advisable to be determined directly in the

body of a construction, in its different zones. For this purpose, a method of ultrasound method and a corresponding device, designed by the authors, are proposed. A profile of the device and a method of measuring as well as its features are described. Recommendations for constructing the calibration curve are quite novel. Dimensions of the device are determined considering the dimensions of the course aggregates of concrete. Experimental researches carried out for testing the device have corroborated its high-performance.

#### **UDC 691.261.1**

**4.C5.2. Free-running bentonitic suspensions for making mold blends.** /N. Ismailov/. Transport and Machine-building. – 2008. – #3(11). – pp. 13-18. – Rus. (res. Geo., Eng.)

Based on an analysis of requirement to blends under present conditions, effective ways of controlling technological characteristics of bentonitic suspensions and mold blends are established. The application of a polyphenolic carbonaceous reagent on the basis of activated bentonite makes it possible to produce a concentrated free-running suspension, also to increase the 'wet' strength and is rather effective during the 'activation' without adding soda.

#### **UDC 531.133.32**

**4.C5.3. Push-pull inverter and its geometrics.** /J.Uplisashvili, Z.Uplisashvili, I.Ugrekheldze, A. Tabatadze/. Transport and Machinebuilding. – 2008. – #3(11). – pp. 19-23. – Rus. (res. Geo., Eng.)

A push-pull inverter produced as a result of realization in a moving mechanical system of inversion is presented. The basic principles of inversion are applied: transformation of a circumference into a straight line, making possible to transform the rotary motion into the rectilinear one. The inverter's special feature is its ability to make two travels of the driving unit during one revolution.

#### **UDC 662.764.37**

**4.C5.4. Polyethylene liners' fabrication method.** /M.Shvangiradze, V.Menteshashvili, D.Shvangiradze/. Transport and Machinebuilding. – 2008. – #3(11). – pp. 24-29. – Rus. (res. Geo., Eng.)

A method of fabrication of polymeric containers is given. The container consists of a polyethylene liner and a layer armored with epoxy tar-saturated fiber. Such containers are twice lighter than steel containers. In addition, their level of safety is considerably higher. In the case of destruction the polymeric container is torn and releases the gas contained in it. As for metal containers, their destruction is accompanied by an explosion and origination of a great number of small-size fragments that is hazardous to human health.

#### **UDC 621.7(088.8)**

**4.C5.5. Interface temperature measurement during skip cutting of a preheated blank.** /K.Inasaridze/. Transport and Machine-building. – 2008. – #3(11). – pp. 30-39. – Rus. (res. Geo., Eng.)

As a result of review of major recent advances in cutting, preconditions for devising a formula for computing skip and periodic cutting of preheated metals and alloys have been established. Using the main principles of the cutting process tribology, it has been established that the actual contact surface of the active section of a cutter represents a definite small part of the nominal contact. The contact thermal resistance and the transitory process length significantly increase on this section. Devising and specification of the calculation formula of the cutting temperature for the processes is our immediate task.

#### **UDC 681.617.43**

**4.C5.6. On the quality of processing on a grinder with pneumomechanical tracer.** /T.Mchedlishvili, V.Kiria, I.Elerdashvili, I.Zedelashvili/. Transport and Machinebuilding. – 2008. – #3(11). – pp. 60-68. – Rus. (res. Geo., Eng.)

Results of a dynamic research in connection with the design of initial and approximated non-linear models are presented. Both complete and truncated linearized mathematical models are obtained for analysis of forced vibration. The present work deals with analytic dependences obtained on the basis of using the dependent model that are necessary for assessing the quality level of the machined surface. Specific design formulas referring to an efficient application of the work results in handling the problems of engineering optimization synthesis of the engineering and process parameters of the system under study are presented.

#### **UDC 621.923:658.5**

**4.C5.7. On the technical and economic multi-objective optimization of design decisions.** /T.Mchedlishvili, G.Tkeshelashvili, T.Mchedlishvili, B.Navrozashvili/. Transport and Machinebuilding. – 2008. – #3(11). – pp. 96-106. – Rus. (res. Geo., Eng.)

Problems of multi-objective optimization related to the design of a homer system of modern machines are considered. The known principal methodological approaches according to the given transitional processes are used as a basis of the theory to be developed; methods of giving the desirable processes

being functionally connected with one or two generalized parameters are proposed for realizing mathematical procedures of the multi-objective synthesis, owing to which the problem of multi-objective, multi-parameter synthesis is reduced to one- or two-parameter problems. Together with technical characteristics also considered are the comparative economic indicators, with the analysis of their basic regularities. The functional sequence of implementation of the design-analytical procedures of the methods constituting the multi-objective synthesis of both the linearized and non-linear homer systems, which is presented as a functional structural scheme, is established

#### **UDC 681.617.43**

**4.C5.8. Analysis of the machined surface quality of composite-profile pieces machined on a profile grinder.** /Kh.Amkoladze, I.Elerdashvili, V.Kiria, I.Narimanashvili/. Transport and Machine-building. – 2008. – #3(11). – pp. 122-126. – Rus. (res. Geo., Eng.)

Dependences necessary for transfer to profiling errors are presented. Specific studies referring to the efficient use of the work results in handling the engineering optimization synthesis problems of both the engineering and technological parameters are conducted.

#### **UDC 629.11.012.84**

**4.C5.9. Research and development of an overhead cable logging machine with two-way traverse skidding** /Z.Balamtsarashvili, G.Kokaia, R.Tkemaladze, G. Asanidze/. Transport and Machine-building. – 2008. – #3(11). – pp. 148-154. – Geo. (res. Rus., Eng.)

In logging under mountain conditions, the most laborious and hazardous phase is the log skidding to the forest depot. It has been established that in wood-cutting areas with down gradient up 20 degrees skidding may be carried out by tractors. However, given hazards of operation of tractors on slopes, we propose that overhead cable logging machines be used instead. The article deals with an overhead cable logging machine with two-way traverse skidding designed at the Georgian Technical University. A technological scheme of the machine operation with two supplementary carriages for high-lead logging is given. Such scheme makes it possible to simultaneously work with two wood-cutting belts, also allows each carriage operate independently, which significantly increase productivity.

#### **UDC 681.617.43:621.7.044.5**

**4.C5.10. Analysis of forced vibrations of a pneumomechanical tracer.** /T.Mchedlishvili, V.Kiria, Kh.Amkoladze, N.Baidarashvili/. Transport and Machine-building. – 2008. – #3(11). – pp. 157-162. – Rus. (res. Geo., Eng.)

For subsequent analysis of forced vibrations, the transfer function numerator of the system under study, constructed on the basis of the obtained approximation model and the expression of input action on the system, has been analyzed. Mathematical expressions defining forced vibrations are constructed on the basis of the known theory of successive approximations of frequency solutions for non-stationary nonlinear systems. Analytical dependences defining frequency solutions of both first and second approximation used for analyzing forced vibrations connected with future profiling errors are obtained.

#### **UDC 534.6**

**4.C5.11. The ways of improving electron-acoustic measuring devices.** /E.Ter-Samvelova/. Works - Appendix to the Newsletter of Academy of Education Sciences of Georgia – 2008. – #11. – pp. 25-26. – Rus. (res. Geo., Eng.)

Examples and peculiarities of up-to-date electron-acoustic measuring devices are considered; the ways of essential application widening, their functions and metrological possibilities are presented.

## **C6. Light Industry**

#### **UDC 675.081.2**

**4.C6.1. Operation research of felt during fine-stapled cotton carding.** /N.Chkhaidze/. Transport and Machinebuilding. – 2008. – #3(11). – pp. 90-95. – Geo. (res. Rus., Eng.)

Research of the pulp combing process between flats and the drum of a carder is presented. The graphs of fiber-length distribution in the lap, web and tow, when working with the flats having general and narrow working width flats, were compiled. The graphs show that that when combing the cotton on the carder, definite sorting out of the fibre by length occurs: a part of long fibers increases in the lap, a part of short fibers - in the tow, the effect being intensified when working with narrow flats. Theoretical and trial graphs of changing the average length of the fiber in the tow, as the flats move to the carding workplaces, were compiled.

#### **UDC 677.051.17**

**4.C6.2. Research of carding process on a carder.** /N.Chkhaidze, G.Kuprashvili/. Proceedings of the Georgian National Academy of Sciences, Chemical series. – 2008. – vol. 34. – #2. – pp. 232-239. – Geo. (res. Rus., Eng.)

Results of theoretic and experimental research of trash detachment from the pulp fed to a carder and of conversion into the flat tow are presented. The trash detachment takes place along the whole working area of carding – the trash amount in the tow increasing from the back to forward knives. Equations for the trash amount in the tow for each workplace of the carding arc, complying with the experimental results have been generated. The most intensive trash detachment takes place in the mid-workplaces, where the separation of the pulp is almost complete.

### **C7. Food Industry**

#### **UDC 338.439**

**4.C7.1. Food safety - scientific bases, modern principles and general provisions of legal regulation.** /K.Laferashvili/. Bulletin of the Center of Strategic Research and Development of Georgia. - 2008. – #110, 111, – pp. 3-90, 2-107. – Geo.

Science-based, practical and legal aspects of modern food safety regulation and existing problems are specified and existing problems are presented.

#### **UDC 338.439**

**4.C7.2. Food adulteration in Georgia.** /E.Sarjeladze, D.Tsulaia/. Bulletin of the Centre of Strategic Research and Development of Georgia. – 2008. – #110, – pp. 91-107. – Geo.

The state of the Georgian food market from the standpoint of adulteration is described. It is mentioned that almost all kinds of adulterated analogues of both local and foreign-made products are met there. Different kinds of adulteration (assortment, qualitative, quantitative, cost, information, technological, complex) are studied. The food adulteration results and proposals and considerations concerning elimination of the cases of adulteration in Georgia are described.

#### **UDC 666.2/3**

**4.C7.3. Lead content in some types of wine.** /Ts.Turkadze, A.Chubinidze, I.Bochoidze, B.Butskhrikidze/. Georgian Chemical Journal. – 2008. – vol. 8. – #4. – pp. 399-401. – Geo. (res. Eng., Rus.)

The article deals with the ecological and chemical factors of lead content in some types of wine given the local ecology and consumption of grape and products made thereof; it presents the results of analysis of the content of lead in the wine made from vineyards located near the highway (50-100 m) and comparatively far away (500 m).

#### **UDC 663.952.1.**

**4.C7.4. Experimental study of green brick-tea drying process.** /G.Gugulashvili/. Transport and Machine-building. – 2008. – #3(11). – pp. 127-132. – Geo. (res. Geo., Rus., Eng.)

The green brick-tea drying process under current conditions is associated with considerable power consumption and requires a large production area. For the design and manufacture of a new modern green brick-tea drier, kinetics of the green brick-tea drying process has been studied by using a specially designed experimental device which makes it possible to control air temperature, humidity and consumption. According to the experimental results, the brick-tea drying process curves were constructed for different temperatures of the working agent and the drying process time curves were produced. A definite optimum value has been found to correspond to every temperature of the working agent. The so-called “drop-down” temperature condition has been proposed for the green brick-tea drying process.

#### **UDC 338.439**

**4.C7.5. Food safety problems in Georgia and basic ways of solving them.** /M.Ujarashvili/. Works - Appendix to the Newsletter of the Academy of Education Science of Georgia. – 2008. – #11. – pp. 66-69. – Rus. (res. Geo., Eng.)

Achievement of the admissible food safety level is considered in the article as an issue of national rather than global importance which, according to the author, holds the main point in the sustainable and safe development strategy of individual states. A factor analysis has identified food safety problems in Georgia and the main ways of their solution: improvement of the functioning efficiency of the agricultural and food industrial complex, the rational government regulation of the food market, the expansion and optimal use of foreign economic relations.

#### **UDC 632.952:612.396.22**

**4.C7.6. Residues of benzimidazole fungicide in products of alcoholic fermentation.** /M.Japaridze, Z.Kuratashvili, I.Abdushelishvili, B.Tsereteli/. Proceedings of the Georgian National Academy of Sciences, Chemical series. – 2008. – vol. 34. – #2. – pp. 206-209. – Rus. (res. Geo., Eng.)

The process of benzimidazole fungicide transformation under alcoholic fermentation has been studied. Carbendazim and 2-aminobenzimidazole were identified in fermentation products. Regularities of the allocation of fungicide residues in the sediment and wine are detected and the rate of fungicide oxidation due to the CO<sub>2</sub> formation is also identified. It is pointed out that the main part of radioactive fungicide is localized in the sediment. In protein compounds of the sediment, radioactive amino acids were not found; therefore, radioactivity of the sediment is conditioned by the interaction between fungicide and the products of its transformation with compounds of the sediment.

### **C8. Construction. Architecture**

#### **UDC 551.58**

**4.C8.1. Consideration of climatic parameters in construction.** /L.Kartvelishvili, Z.Tskvitinidze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 132-141. – Geo. (res. Geo., Eng., Rus.)

Different complex climatic parameters and their distribution patterns in time and space are discussed. The obtained data are necessarily to be taken into account when designing construction projects.

#### **UDC 699.844**

**4.C8.2. Sound proofing of conference rooms and directors' offices.** /M.Javakhishvili, M.Tchanturia, I.Garibashvili, R.Zhgenti/. Energy. – 2008. – #4(48). – pp. 84-87. – Geo. (res. Geo., Eng., Rus.)

When discussions and negotiations are held "behind closed doors" sound proofing must comply with existing standards. First of all, it concerns conference rooms and directors' offices. In this case, the most effective measure is to arrange the so-called 'lobby'. Different sound-proof materials (plates, pastes, etc.) and deafening facilities are discussed.

#### **UDC 691.175.3**

**4.C8.3. Processing, marking, cutting and fixing of glass-fiber-gypsum plates.** /V.Javakhishvili, M.Chanturia, I.Garibashvili, R.Zhgenti/. Energy. – 2008. – #4(48). – pp. 88-91. – Geo. (res. Geo., Eng., Rus.)

Glass-fiber-gypsum plates are cut on the smooth and firm surface, following their marking, by means of a special cutter. The pre-cutting preparation process and the cutting process itself, as well as the post-cutting fixing/mounting of the cut plates are discussed.

#### **UDC 691.32**

**4.C8.4. Research of the physico-mechanical and technical characteristics of concrete on the basis of a theoretical analysis.** /V.Lomidze, T.Jojua, T.Turmanidze/. Energy. – 2008. – #4(48). – pp. 92-98. – Geo. (res. Geo., Eng., Rus.)

One of the plane problems of the elasticity theory is considered. Pursuant to the concept of the theory of finite elements, an object is presented in the form of totality of small elements. For each element dependencies of the elasticity theory are recorded. On the basis of it, the corresponding values are computed. Conditions of continuity and balance are satisfied by means of the solution of a uniform system of equation. For solving the assigned task, a method of separation is applied. Design diagrams, static and kinematic boundary conditions are presented. 2 cases are considered: first – there is an ideal constraint between the elements of separation, the second - where such a constraint is absent. By means of satisfaction of geometric and static conditions for the elements of separation, unknown coefficients are eliminated gradually until specific numerical values are obtained. A way of solution of the assigned task is shown by a specific example. For this, a concrete block located between two hard platforms, which are under load, is examined. The task is symmetrical. By using an expression for a stress function, the values of the stress and relocation of the elements of separation are obtained. The further process is the satisfaction of boundary conditions. After the last process, has been completed, the design coefficients  $A_1^n, \dots, A_4^n$  assume specific numerical values.

## C9. Agriculture and Forestry. Fisheries

### UDC 631.416.143

**4.C9.1. Mathematical study of soil salinity variability.** /A.Surmava, N.Tugushi, L.Shavliashvili, L.Intskirveli, S.Mdivani/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 322-330. – Rus. (res. Geo., Eng., Rus.)

By numerical integration of the water and dissolved nitrite infiltration equations in the soil one of methods of salinity reduction in the top layer of the saline soil used in practice is numerically simulated. The numerical investigation shows that the simulated method, at the certain values of the coefficients of the infiltration and diffusion and at a triple irrigation for 90 days, can decrease the salinity in the upper 70cm-layer of soil. The dissolved from the upper layer salt is gradually washed away and into a deeper layer, leading an insignificant increase of the salinity of the ground below 70 cm.

### UDC 636.085/.087

**4.C9.2. Feasibility of application of coarse mulberry leaf gathered in late autumn as cattle fodder for, development of appropriate technologies and economic efficacy.** /G.Nikoleishvili, B.Korokhashvili, B.Sakandelidze, S.Turmanidze, E.Choladze/. Agrarian-economic Science and Technologies. – 2009. – #1. – pp. 21-30. – Geo. (res. Eng.)

According to the results of studies implemented at the Educational-Research Institute of Sericulture, coarse mulberry leaf stored in autumn can be successfully used animal husbandry as feed. In all cases, one has to study biochemical characteristics of the leaf and determine its nourishing value. The feasibility and economic efficiency of utilizing the leaf prepared in spring from various plantations of the recommended mulberry varieties, as well as the leaf stored in autumn for winter, leaf flour and other types of fodder will be studied at Kutaisi Zonal Station of Sericulture.

### UDC 631.51

**4.C9.3. Recommendations for effective use of arable lands.** /S.Kamarauli, L.Kamarauli/. Agrarian-economic Science and Technologies. – 2009. – #1. – pp. 61-67. – Geo. (res. Eng.)

Given the outdated agricultural equipment as well as shortage of farm machinery and labor force, the work recommends enlargement of the existing small land plots by setting up farm cooperatives according to rural settlements, implying the setting up of one or several cooperatives within a settlement.

### UDC 631.1.017.3-058.232.6

**4.C9.4. The operating leverage efficiency in small farms.** /L.Chiburdanidze/. Agrarian-economic Science and Technologies. – 2009. – #1. – pp. 68-75. – Geo. (res. Eng.)

The main principles for defining the operating leverage efficiency are considered to be: 100% marketability of production; 100% sales revenue; evaluation of the consumed materials and performed work at current market prices. Under conditions of a market economy, farmers should be financially stable. The financial stability for farmers is the difference between the sales revenue and the profitability level. If a farmer's sales revenue is less than the profitability level, his financial situation will worsen and a shortage of liquid assets will be created.

## C10. Water Industry. Melioration

### UDC 551

**4.C10.1. Fresh water resources' potential and management in Georgia.** /V.Geladze, G.Geladze, N.Bolashvili, N.Machavariani/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 41-45. – Geo. (res. Geo., Eng., Rus.)

Fresh water resources of Georgia, exportable fresh water amount by regions and periods, water intake technique and place determinable after a detailed analysis of the state of individual hydro-ecosystems and water balances are considered.

### UDC 551

**4.C10.2. Year's beginning impact on relationship and trend between the annual river runoff and drift.** /G.Grigolia, D.Kereselidze, V.Trapaidze, G.Bregvadze, N.Tsintsadze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 228-233. – Geo. (res. Geo., Eng., Rus.)

Climatic changes and the relevant changes in the river drift and run-off are generally studied in annual intervals. Standard processing and publication of materials are accomplished according to calendar years (from 1/I). The work corroborates that at different beginnings of the year, the correlation coefficient of the relation and trend between the annual runoff and drifts changes, and recommends starting annual calculations in the water-management year (1/IV), when the uniformity of annual values is more preserved and the correlation between annual drifts and runoffs is the greatest.

#### **UDC 556.55**

##### **4.C10.3. Connective boundary problem of dynamic interaction of a mudflow intruded in a water reservoir with water.** /J.Kilasonia/. Energy. – 2008. – #4(48). – pp. 39-42. – Geo. (res. Geo., Eng., Rus.)

A connective boundary problem reflecting the dynamic interaction with water of large-scale underground waters intruded at a high speed in the water area and the resulting wave processes is considered. To formulate the problem, the author-modified systems of differential equations of the two-dimensional theory of “shallow” water for the mudflow and water respectively, which are interconnected by means of the time-and-space-variable inner boundary, also the general algorithm of calculation are given.

#### **UDC 627.43/8**

##### **4.C10.4. Prognosis of the effect of waves in the tail-water originated as a result of a break of Algeti and Sioni dams.** /T.Gvelesiani, G.Palavandishvili, B.Maglaperidze, G.Berdzenashvili/. Energy. – 2008. – #4(48). – pp. 43-47. – Geo. (res. Geo., Eng., Rus.)

During 2007, two projects (within the program for rehabilitation of water-engineering systems of melioration designation in Georgia) concerning the prognosis of the waves effect in the tail-water were implemented. The tentative origin of the waves is associated with a partial or complete destruction of Algeti and Sioni dams. The article describes the projects, methods used to implement them, as well as the relevant graphic material.

### **C11. Foreign and Domestic Trade. Tourism**

#### **UDC 551.582**

##### **4.C11.1. Tourism climatic index in Tbilisi.** /A.Amiranashvili, A.Matzarakis, L.Kartvelishvil/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 27-30. – Eng. (res. Geo., Eng., Rus.)

Tourism climatic potential assessment for Tbilisi (the capital of Georgia) is given in accordance with the frequently used in other countries the “tourism climatic index” (TCI).

#### **UDC551.582**

##### **4.C11.2. Climatic, aeroionization and radiological characteristics of Tskaltubo health resort and tourist complex.** /N.Saakashvili, M.Tabidze, I.Tarkhan-Mouravi, et al./. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 31-40. – Rus. (res. Geo., Eng., Rus.)

The study results of the climatic, aeroionization and radiological characteristics of Tskaltubo town as well as of Tetri Mgvime, Sataplia and Tskaltubo caves are presented.

### **C12. Transport**

#### **UDC 621.43.019.2:629113/115**

##### **4.C12.1. Efficiency of conversion of automobiles to autogas.** /O.Gelashvili, I.Tsertsvadze, T.Niauri/. Transport and Machine-building. – 2008. – #3(11). – pp. 5-12. – Rus. (res. Geo., Eng.)

The efficiency of using liquefied gas to fuel cars and of converting cars to autogas is analyzed. The possibility of using cars equipped with gas cylinders as well as the expediency of their running on compressed and liquefied natural gas is discussed. Large-scale use of automobiles running on autogas has been found to significantly decrease consumption of costly petrol and diesel fuels. The autogas-fuelled cars exhibit performance and operational characteristics comparable with those of their petrol and diesel competitors, while generating lower running and maintenance costs.

#### **UDC 621.43.019.2:629113/115**

##### **4.C12.2. Influence of gasoline fumes' characteristics on automobile ecological compatibility.** /J.Iosebidge, G.Abramishvili, T.Apakidze, A.Chkheidze, Kh.Mgebrishvili/. Transport and Machine-building. – 2008. – #3(11). – pp. 52-59. – Geo. (res. Rus., Eng.)

This article, based of literary sources and using a novel approach, analyzes the influence of gasoline fumes' characteristics (gasoline distillation, saturated steam pressure, volatility index) on the performance of an automobile engine (easiness and reliability of cold engine start-up in cold weather, duration of warming-up, completeness of burning of the air-fuel mixture, engine power, acceleration, wear of details of the cylinder-piston group, formation of the so-called “vapour locks” in the fuel system pumps and pipelines, increase of gasoline losses during storage, transportation and consumption, fuel saving, etc.); a conceptual dependence between these characteristics and environmental safety of automobiles has been established.

## UDC 625

### **4.C12.3. All-round automated fire-prevention control systems of transport tunnels.**

/E.Moistsrapishvili, M.Moistsrapishvili, G.Enukidze, N.Arudashvili/. Transport and Machine-building. – 2008. – #3(11). – pp. 69-75. – Geo. (res. Geo., Rus., Eng.)

The paper briefly discusses high risks of fire and its quick spread in transport tunnels; the examples of great fires happened abroad are considered; all-round automated fire-prevention control systems, their subsystems and a functional scheme of the control system block are analysed. The function of the equipment and the principle of operation of the active fire-prevention automated control system block are described. It is noted that the data of the system block of active fire-prevention automated control are universal and can be used in other objects as well; at the same time, it is necessary that technical regulations of fire safety be developed. The article proves the possibility of using contemporary automated systems to form a successive block diagram of fire prevention measures and to develop the operation principles of the elements of the system with consideration of construction peculiarities, as well as to create a computer system of centralized control of the fire-prevention complex.

## UDC 613.114.05

### **4.C12.4. Development of a logistic system for efficient automotive fuel consumption control under conditions of motor transport enterprises.**

/O.Gelashvili, B.Kitsmarishvili, T.Matsiashvili, T.Niauri/. Transport and Machine-building. – 2008. – #3(11). – pp. 83-89. – Rus. (res. Geo., Rus., Eng.)

The work deals with the questions of formation of the operational automotive fuel consumption and analyzes the methods of its rationing. Methods for determining the minimal automotive fuel consumption are developed and a new approach providing the fuel consumption reduction in operation is proposed. A three-stage qualitatively novel logistic system of automotive fuel control ensuring operational detection and elimination of the reasons of fuel over-expenditure and yielding a great economic effect under conditions of motor transport enterprises has been developed.

## C13. Medicine. Healthcare

## UDC 616.831

### **4.C13.1. Brain focal changes and hemodynamic parameters in relation to the state of collateral circulation.**

/F.Todua, D.Gachechiladze, M.Beraia/. Bulletin of the Georgian National Academy of Sciences. – 2008. – vol. 2. – #3. – pp. 134-140. – Eng., Geo. (res. Eng.)

The paper aims at studying the state of collateral circulation in patients with unilateral high-grade stenosis and occlusion of the internal carotid artery (ICA). 41 patients with severe stenosis and 30 patients with occlusion of ICA underwent brain MRT, 3D TOF-MR-imaging, Doppler ultrasound of extra-intracranial vessels to investigate collateral flow via the circle of Willis and via the ophthalmic artery (OphA). Maps of the cerebral perfusion parameters were calculated. In 50 (70%) cases, the “symptomatic” cerebral ischemia was noted. In symptomatic patients, cortical MCA infarctions (13(26%)), and border-zone infarctions-10(20%) prevailed. In the cases of unilateral ICA, the occlusion compensatory dilatation of contralateral ICA and enhancement of the circulation volume by 60%, also the enhancement of circulation in the vertebral arteries by 18% was observed. In patients, where the anterior communicating artery was inactive, both deterioration of the flow intensity in the MCA ( $V_{\text{mean}}=38\text{cm/s}$ ,  $PI=0.69$ ) as well as a higher incidence of brain infarction (13(85%)) were observed. In patients with the functioning anterior communicating artery 2 infarctions ( $V_{\text{mean}}=44\text{cm/s}$ ,  $PI=0.77$ ) were observed. Based on the above, it can be presumed that the anterior communicating artery the most important extracranial occlusive process compensation collateral. In patients, where the functioning of the communicating arteries of the circle of Willis is not observed, or where only the posterior communicating artery is functional, high infarction development risk (generally of the border zone) is revealed. Complex use of TCCD, 3D TOF-MR-angiography and PWI practically provides all necessary information about the functional status type of collateral circulation in the case of significant stenosis the carotid.

## UDC 616-021.3

### **4.C13.2. Clinical manifestation and long-term prognosis of viral and idiopathic dilated cardiomyopathy.**

/N.Kipshidze, K.Nadaraia/. Bulletin of the Georgian National Academy of Sciences. – 2008. – vol. 2. – #3. – pp. 141-148. – Eng., Geo. (res. Eng.)

The aim of the present study was to evaluate and compare a long-term prognosis and clinical courses of viral and idiopathic (two of the most widespread and heavy) forms of dilated cardiomyopathy (DCM). In total, 144 patients (mean age  $43.8 \pm 12$  years, range 15-68 years, m122/f22) with DCM were enrolled in the study since 1991. Besides standard examinations, serologic tests for antibodies to cardiotropic viruses (ELISA method) were performed. The patients were divided into 2 groups (Gr.) according to the results of serologic tests and patients' clinical and history data. In the case of lethal outcomes we used existing medical reports and/or interviewed family members to determine the cause of death. The Odds

and Hazard Ratio, Kaplan-Meier methods were used for statistical analyses of the data obtained. In 77 (53.5%) out of 144 patients with DCM, together with acute respiratory infections in anamnesis we observed positive serologic reaction to cardiotropic viruses (Gr.1). 67 (46.5%) patients with idiopathic DCM entered Gr.2. During a 5-year observation period, 69 (47.9%) patients died, and 75 (52.1%) patients survived. The life-expectancy was  $4.1\pm 2.0$  and  $4.9\pm 2.8$  years for Gr.1 and Gr.2 respectively. The 3-year mortality rate made 33.8% and 26.5%, the 5-year mortality rate - 53.2% and 41.8% respectively. The most common causes of DCM mortality were progressive heart failure and sudden death (in gr.1 – 43.9% vs 31.7% and in gr.2 – 35.7% vs 46.4%, respectively.) We conclude that more than half of DCM cases are of viral etiology. Viral DCM is characterized by higher severity of clinical manifestation, more rapid development of progressive heart failure and higher mortality rates than idiopathic DCM.

## **D. INTERSECTORAL ISSUES**

### **D1. Organization and Management**

#### **UDC 658.3**

**4.D1.1. Innovation management of personnel work.** /N.Paichadze/. Economics and Business. – 2008. – #2. – pp. 78-86. – Geo. (res. Eng.)

Theoretical and practical problems of innovation management of personnel work are discussed. They imply any organization activities, organization decision-making, procedure or personnel management method that essentially differ from the practiced ones and are used in a given organization for the first time. Special attention should be paid to the organization of the innovation potential development, revealing and realization of novelties in terms of personnel work.

#### **UDC 658**

**4.D1.2. Organizational structuring of contemporary business management.** /E.Gulua/. Economics and Business. – 2008. – #2. – pp. 102-111. – Geo. (res. Eng.)

The article deals with modern aspects of management structuring in a business organization that imply the grouping of activity types and personnel for achieving the objective that had been set in advance. The selection of a structure depends on the specifics of individual business subjects/companies: type of activity, activity scale, existing situations. The industrial structure of a company is determined by its profile, diversification or specialization level, quantitative and qualitative composition of products. The organizational and management structures generally coincide: management structuring and implementation of specialized functions are carried out according to the organization divisions. The management structure is determined by different factors, such, for example, as the organizational and legal status of a company, its size, departmental belonging. Classical examples of the organization structures are: hierarchical, functional and mixed. On the other hand, each of them can be subdivided. Under conditions of changeable markets and demands, special attention shall be given to the ability of maneuvering – rapid changing of the strategy and tactics. Correspondingly, any organization must be easily restructured and reformed.

### **D2. Environmental Protection. Ecology**

#### **UDC 91 (479.22)+632.118.3**

**4.D2.1. Specificity of anthropogenic pollution of mountain biogeocenoses under conditions of global warming.** /E.Salukvadze, M.Gogebashvili, N.Ivanishvili/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 90-96. – Rus. (res. Geo., Eng., Rus.)

The study aims at revealing the realization of anthropogenic pollution of mountain biogeocenoses under conditions of global warming. The process may be formed as follows: the pollution factor – low vegetation growth – phytocenosis with low adaptation potential – modification of hydrological parameters of biogeocenosis – development of adverse processes in the critical highland landscapes.

#### **UDC 630:551.58**

**4.D2.2. Influence of global warming on changes in agroclimatic zones.** /G.Meladze, M.Tutarashvili, M.Meladze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 97-104. – Geo. (res. Geo., Eng., Rus.)

As a result of analysis and processing of the meteorological observation data, a close correlation between the dates of the air temperature rise above  $10^{\circ}$ , the sum of active temperatures and altitude above sea level has been established. On the basis of the established correlations, the regression equations are made, according to which sums of active temperatures for agroclimatic zones are defined. 5 agroclimatic zones for distribution of various agricultural crops are allocated. According to the scenario, upon the

temperature rise of 1°, the area of distribution of citrus, grape, tea, cereals, winter wheat and other crops has gone up to 100-150 m. above sea level, as compared with their existing distribution areas, and upon the temperature increase by 2°, - up to 200-300 m. a.s.l.

#### **UDC 551**

**4.D2.3. Joint statistical analysis of the river runoff and precipitation against the background of climatic change.** /G.Grigolia, M.Alaverdashvili, V.Trapaidze, et al/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 105-111. – Geo. (res. Geo., Eng., Rus.)

Against the background of global warming of the climate, a joint evaluation of the river runoff and its principal determining factor - changes in precipitation by linear regression and trend (with the correlation coefficient between the random number and its ordinal number) is extremely urgent. The trend of average monthly and seasonal (III-V, VI-VII, IX-XI, XII-II) discharges of the Vere River and precipitations is estimated. The trend in mean of the annual individual monthly runoffs has been calculated with the aim of establishing the annual variability. The correlations between the runoffs in the specified periods and precipitations have been determined.

#### **UDC 555.48.215.2**

**4.D2.4. A possibility of improving the calculation of water resources based on the application of the moisture circulation parameters against the background of climate change.** /N.Begalishvili, T.Tsintsadze, V.Tsomaia, et al/. Transactions of the Georgian Institute of Hydrometeorology – 2008. – vol. 115. – pp. 112-121. – Geo. (res. Geo., Eng., Rus.)

The work deals with a possibility of calculation of the characteristics of water resources (precipitation, river runoffs and glacier accumulation-ablation) based on the moisture circulation parameters, under conditions of suspended hydrometeorological observations. The calculation of river water resources' parameters are given for warm, cold seasons and annual periods. For the non-associated and associated series, the results are positive, provision being within 80 to 98 percent.

#### **UDC 551.465.5**

**4.D2.5. Modelling and forecast of the Black Sea circulation processes.** /A.Kordzadze, D.Demetrashvili/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 122-131. – Rus. (res. Geo., Eng., Rus.)

Some results of modelling of the dynamic processes in the whole Black Sea and in the Georgian sector of the sea basin on the basis of the baroclinic prognostic models of the Black Sea general (spatial resolution 5 km) and regional circulations (spatial resolution 1 km) developed at M.Nodia Institute of Geophysics are considered.

#### **UDC 551**

**4.D2.6. Transparency of atmosphere in the coastal area of Ajara.** /R.Solomonidze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol.115. – pp. 234-241. – Geo. (res. Geo., Eng., Rus.)

In 2007-2008, about 450 complex experiments have been carried to study transparency of the atmosphere in the coastal area of Ajara. The effects of temperature, humidity and wind on the atmospheric transparency were established. The influence of the sea on the transparency of atmosphere in the littoral area was studied.

#### **UDC 550.42;54.064**

**4.D2.7. Dependence of concentrations of different chemical elements in the atmospheric precipitation of Kakheti region of Georgia on total mineralization.** /G.Supatashvili, M.Salukvadze, L.Abesalashvili, T.Salukvadze, E.Khelaia/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. - pp. 242-245. – Rus. (res. Geo., Eng., Rus.)

Results of a research of the concentration of some chemical elements (B, P, Br, I, Cu, Pb) in the atmospheric precipitation of Kakheti region of Georgia are presented. The dependence of the concentration of these elements upon total mineralization is studied.

#### **UDC 551.50.501.7**

**4.D2.8. Use of satellite information for early warning of hydrometeorological disasters in Georgia.** /G.Kordzakhia, L.Shengelia, G.Tvauro, M.Tatishvili, I.Mkurnalidze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 250-260. – Geo. (res. Geo., Eng., Rus.)

The use of satellite information for prevention or/and mitigation of disasters of hydrometeorological origin on the territory of Georgia is reviewed. Various characteristics of modern satellites are presented. The disasters that are typical for Georgia and for the prevention of which the satellite information is used are considered.

#### **UDC 551.510.04**

**4.D2.9. On the meteorological aspects of macro-transfer of atmospheric pollutants in mountain regions.** /G.Gunia, Z.Tskhvitinidze, B.Kholmatjanov, Z.Fatkhulaeva/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 261-271. – Rus. (res. Geo., Eng., Rus.)

Results of the investigation of influence of foehn events at a level of atmospheric pollution are observed by the examples of Kolkheti lowlands (the south-west part of Caucasus) and Akhtangar valley (the western Tien Shan). The calculations of distribution fields of NO<sub>x</sub> concentration in the region of Akhtangar valley are presented. The foehn events are shown to have an important impact on the level of atmospheric pollution under conditions of mountainous countries. Their consideration during regional investigations of atmospheric pollutants will significantly raise the accuracy of ecological assessment of the natural environment state. It is concluded that the said meteorological event should be ranked as regional “dangerous meteorological conditions” that enhance atmospheric pollution.

#### **UDC 551.515.1.4**

**4.D2.10. Short-range numerical prediction of extreme precipitation for Georgia.** /N. Kutaladze, I. Megrelidze, G. Mikuchadze, I. Chogovadze, T. Davitashvili/. Transactions of the Georgian Institute of Hydrometeorology. -2008. - vol.115. - pp. 272-278. - Geo. (res. Geo., Eng., Rus.)

Run of local area model with boundary conditions from the global model (GFS), was implemented taking into account local Physical-Geographical and meso and micro scale parameters. These results were improved by 2-way nesting method into parent domain. In the example total surface precipitation forecast, received by mentioned method and it's observed fields are in close agreement.

#### **UDC 551.594(063)**

**4.D2.11. Thunderstorm activity characteristics in Georgia.** /A.Amiranashvili, O.Varazanashvili, A.Nodia, N.Tsereteli, I.Mkurnalidze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 279-285. – Rus. (res. Geo., Eng., Rus.)

The distribution of mean periodicity of the number of days with thunderstorms per annum on the territory of Georgia has been mapped. The estimation of the density values of lightning discharges to the earth for each meteorological station and for 12 administrative regions of Georgia is carried out. The dependence of thunderstorm activity on the height of locality is studied.

#### **UDC 502.573**

**4.D2.12. Assumed ecological consequences of the forest fire in the Borjomi-Kharagauli National Park in August 2008.** /A.Amiranashvili, T.Bliadze, V.Chikhladze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 286-293. – Geo. (res. Geo., Eng., Rus.)

It is assumed that as a result of a forest fire in the Borjomi-Kharagauli National Park changes in the microclimatic and bioclimatic characteristics both on the territory of the fire and in the adjacent locality will occur. In order to assess the scope of negative impact of the damaged area, to mitigate the disastrous effects of this technogenic catastrophe and to take the necessary measures for this purpose, a detailed study of these characteristics is to be carried out.

#### **UDC 551.59**

**4.D2.13. The spatial structure of hazardous meteorological phenomena over Georgian territory.** /O.Varazanashvili, E.Elizbarashvili/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 294-302. – Geo. (res. Geo., Eng., Rus.)

Such hazardous meteorological phenomena as draughts, frosts, stormy winds, blanket fog and icing are discussed. The special criteria elaborated considering the intensity of phenomena and consequent expected damages are based on the images of spatial fields of those phenomena in GIS.

#### **UDC 550.42;54.064**

**4.D2.14. Dependence of total mineralization of atmospheric precipitation on the surface air temperature at constant value of relative humidity.** /T.Salukvadze, M.Salukvadze, E.Khelaia/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 331-334. – Rus. (res. Geo., Eng., Rus.)

The temperature effect of the ground stratum of air on atmospheric precipitation mineralization at constant values of relative humidity is studied. Analysis of the statistically supported experimental material has found that the temperature-mineralization dependence graph for three ranges of relative humidity (30-55; 55-75 and 75-100 %) has two maximums, which, together with decrease of the relative humidity, shift towards large temperature values.

#### **UDC 546.296:616-006.6**

**4.D2.15. Radon distribution and lung cancer in individual regions of West Georgia.** /A.Amiranashvili, T.Chelidze, K.Gvinianidze, G.Melikadze, M.Todadze, I.Trekov, D.Tsereteli/.

Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 349-353. – Eng. (res. Geo., Eng., Rus.)

According to data of more than 100 water samples taken in individual regions of West Georgia, they contain of radon is rather high. This research once again corroborates the correlation between the radon concentration and prevalence of lung cancer.

#### **UDC 521.15**

**4.D2.16. Puter earthquake trigger factors.** /M.Kachakhidze, G.Ramishvili, N.Kachackidze, R.Kiladze, V.Kukhianidze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 354-358. – Eng. (res. Geo., Eng., Rus.)

Special distribution of planets or pairs of planets on the firmament is regarded as an earthquake trigger factor. Sectors, in which the number of earthquakes becomes maximal or minimal when planets or pairs of planets are found within them, have been identified.

#### **UDC 550.540**

**4.D2.17. On the method of detecting quasi-periodic earthquake synchronising factors in the Caucasus.** /O.Lursmanashvili, T.Paatashvili, L.Geondjian/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol.115. – pp. 359-368. – Rus. (res. Geo., Eng., Rus.)

A mechanism of earthquake synchronisation by external impact is proposed. The possibility to detect this external factor by examination of the shapes of histograms representing the distribution of earthquakes' occurring moments is shown. The tidal impact with the lunar-solar synodic month period on the Caucasus earthquakes is found.

#### **UDC 550.340**

**4.D2.18. False periodicities in earthquakes spectra in the Caucasus induced by industrial explosions.** /O.Lursmanashvili, T.Paatashvili, L.Geondjian/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 369-374. – Rus. (res. Geo., Eng., Rus.)

The study of possible diurnal periodicity of earthquakes on the base of the Catalogue of Caucasus Earthquakes, very distinctly reveals this phenomenon for events with  $K < 9$ , and the absence of diurnal period for stronger quakes. We reveal that the catalogue contains a set of industrial explosions, identified as natural events. The study of possible natural diurnal periodicity for the purpose of earthquake prediction needs very careful analysis of industrial activity to avoid erroneous conclusions and artifacts.

#### **UDC 550.34**

**4.D2.19. Seismohydrodynamic observations on the territory of Georgia.** /G.Melikadze, T.Jimsheladze, G.Kobzev, N.Kapanadze, N.Dovgal/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 375-380. – Geo. (res., Geo., Eng., Rus.)

A multitude of anomalies have been recorded during the current regime hydrodynamic observations on the territory of Georgia since 1985. An analysis carried out to identify their nature established that critical values of deformation stresses in the groundwater regime are known for a characteristic disturbance of background stress. The period of disturbance depends on the strength of earthquake. The largest gradient zone in the hydrogeodeformative field indicates future seismic focus.

#### **UDC 551.491**

**4.D2.20. Variation of hydro-chemical regime of underground water during preparation of seismic events.** /M.Todadze, N.Kapanadze, G.Melikadze, V.Ghlonti, T.Jimsheladze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 389-393. – Geo. (res., Geo., Eng., Rus.)

The data analysis results show the effect of seismicity on the hydro-chemical regime of the underground water. Based on the analyses carried out, major informative components for each area and for the region have been selected.

#### **UDC 551.58.583**

**4.D2.21. Climatic extremes' calculation results for Georgia's mountainous regions.** /N.Kutaladze, Z.Tskvitinidze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 394-401. – Geo. (res., Geo., Eng., Rus.)

Based on the data of 21 stations of the Georgian meteorological network, extremal climatic indices were calculated, multiannual trends of their dynamics revealed and their statistical stability established. Based on the above, climatic risks were assessed and mostly vulnerable areas determined.

#### UDC 523.58

**4.D2.22. Investigation of concentration of solid aerosol particles in the surface air layer of Tbilisi.** /N.Chiabrishvili/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 412-416. – Rus. (res.: Geo., Eng., Rus.)

Experimental data on research of the weight concentration of solid particles of aerosol ( $\mu\text{m mg/cu m}$ ) in the surface air of Tbilisi are obtained. The distribution of the probability density of the weight concentration of solid aerosol particles is studied. The distribution graph and the values of the constants characterising this distribution are presented.

#### UDC 555.48.215.2

**4.D2.23. A possibility of calculation and forecast of maximum water discharges of catastrophic floods based on the application of the moisture circulation parameters under condition of closed-up observation stations.** /G.Gachechiladze, V.Tsomaia, L.Kitiashvili, S.Gorgijanidze, N.Begalishvili/. Transaction of the Georgian Institute of Hydrometeorology – 2008. – vol. 115. – pp. 417-426. – Rus. (res. Geo., Eng., Rus.)

The work deals with a method of calculation of moisture circulation parameters and a possibility of estimating and forecasting maximum water discharges and daily precipitation, with the maximum 1-percent security. The testing of the method on the Ajarian Black Sea coastal area rivers produced positive results – error less than 4 to 5 percent.

#### UDC 551.58:613.1

**4.D2.24. Impact of effective air temperature and geomagnetic storms on the health of Tbilisi City population.** /A.Amiranashvili, V.Amiranashvili, L.Kartvelishvili, Kh.Nodia, T.Khurodze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 434-437. – Rus. (res. Geo., Eng., Rus.)

The results of investigation of the impact of monthly average values of the air equivalent- effective temperature (combination of temperature, air relative humidity and wind velocity) and monthly duration of magnetic storms on the health of the Tbilisi City population are presented.

#### UDC 621.472

**4.D2.25. Environmentally friendly power station.** /V.Jamarjashvili, M.Arabidze/. Energy. – 2008. – #4(48). – pp. 29-38. – Geo. (res. Geo., Eng., Rus.)

A problem of conversion of high-pressure natural gas into electric power by using solar energy on the basis of multistage gas expansion is considered. The respective thermodynamic processes are presented. A plane solar collector is used as the solar energy converter. The most reasonable method for utilizing potential energy of high-pressure gas is the use of turbo-expanders. A solar electric power station (SES) is characterized of a high value of energy conversion factor  $\eta_{\text{ef}} = 0.73$ . It is pointed that in the case of using a steam-turbine, flat-collector cycle, the factor will be  $\eta_{\text{ef}} = 0.07-0.08$  (under  $t = 100^{\circ}\text{C}$ ). By power density, the SES will also exceed all the known systems of solar energy conversion into electric power. In addition, it is more effective than traditional power stations. High effectiveness of SES is conditioned by using the potential energy of high-pressure natural gas. Determination of performance characteristic of the SES is the subject of future research.

#### UDC 62:574

**4.D2.26. The influence of anthropogenic factors on the formation of carcinogenic agents.** /N.Ramazashvili, L.Chkheidze/. Transport and Machine-building. – 2008. – #3(11) – pp. 107-114. – Geo. (res. Geo., Rus., Eng.)

Results of an environmental monitoring conducted on the territory of Georgia are discussed. Special attention is paid to the compounds of aromatic carbohydrates, nitrogen oxides and metals in the human and animal food chain, as well as to the synthesis of carcinogenic agents that can lead to the formation of tumours. Measures to protect humans and animals from such effects are proposed

#### UDC 681.586.5

**4.D2.27. Distributed fiber optic sensors to protect and monitor pipelines integrity.** /G.Mgeladze/. Georgian Oil and Gas. – 2009. – #23. – pp. 76-87. – Geo. (res. Geo., Rus., Eng.)

Pipelines are essential components of the energy supply chain and the monitoring of their integrity has become a major task of the pipeline management and control. The presented article gives some information about the best way to protect pipelines using fiber-optical technologies. We have described the ability of distributed fiber-optic sensors to control and monitor pipelines integrity. The advantage is shown and the effectiveness of sensing system based on Brillouin and Raman scattering are used to protect pipeline leakage, verify pipeline operational parameters, and prevent failure of pipelines.

### D3. Statistics

#### UDC 550.348/349

**4.D3.1. Statistical analysis of earthquake precursors.** /H.Petrosyan/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 381-388. – Eng. (res. Geo., Eng., Rus.)

The results of a statistical analysis of precursors of about twenty earthquakes in the territory of Armenia are presented.

#### UDC 551.578.7

**4.D3.2. Statistical characteristics of the number of hail days per annum in Georgia.** /A.Amiranashvili, O.Varazanashvili, A.Nodia, N.Tsereteli, T.Khurodze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 427-433. – Rus. (res. Geo., Eng., Rus.)

A map of the distribution of mean periodicity of the number of hail days per annum on the territory of Georgia is completed. The ranges of a change in the hail activity for 12 administrative regions of Georgia are determined. The dependence of hail activity on the height of locality is studied.

### D4. Other Intersectoral Issues

#### UDC 551.58

**4.D4.1. Investigation of some climate change peculiarities in Georgia by mathematical modelling.** /T.Davitashvili, Z.Khvedelidze, A.Khantadze, K.Tavartkiladze, I.Samkharadze/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 7-18, – Eng. (res. Geo., Eng., Rus.)

Specific regional climate change peculiarities on the territory of Georgia are investigated by mathematical modelling, in particular, the cooling effect in the western Georgia and the climate warming in the Eastern Georgia. Specific peculiarities of the thermodynamic model describing the desertification process are discussed. For describing the desertification favouring processes, the behaviour of the earth surface temperature and precipitations are studied.

#### UDC 551

**4.D4.2. Zoning of the Georgian territory on the drought intensity evaluation basis.** /N.Begalishvili, T.Tsintsadze, M.Gzirishvili, N.Arutian, R.Mahmudov/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 303-307. – Geo. (res. Geo., Eng., Rus.)

Results of atmospheric and soil drought development, also a complex evaluation of drought intensity on the territory of Georgia are discussed on the basis of the method developed at the Scientific-Research Institute of Agriculture of Russia. The data of observations conducted by 15 weather stations in 1961-1986 are applied. Schematic maps of climatic zoning of the territory of Georgia according to the evaluation of drought intensity for the 4 months of the warm period (May-August) are developed.

#### UDC 556.16.O6

**4.D4.3. Characteristics of floods on the rivers of Georgia and ways of their prevention.** /Ts.Basilashvili/. Transactions of the Georgian Institute of Hydrometeorology. – 2008. – vol. 115. – pp. 308-316. – Geo. (res. Geo., Eng., Rus.)

Statistical characteristics of the flood peaks for the most important rivers of Georgia being formed as a result of precipitation and snow melting in May and June are calculated. These represent initial and essential data for designing and projecting water economy facilities. A set of measures for avoiding and preventing probable environmental disasters are worked out

#### UDC 519.233.4

**4.D4.4. A simplified solution of the transcendental equation of dispersion for studying standing waves on the water surface.** /T.Gvelesiani, T.Kirimlishvili-Davitashvili/. Energy. – 2008. – #4 (48). – pp. 48-50. – Geo. (res. Geo., Eng., Rus.)

In different natural or artificial reservoirs, also in hydraulic trays (basins) standing waves may arise under the effect of repetitive fluctuations on these bodies. To study these waves, the transcendental equation of dispersion should be solved (i.e. the roots of this equation must be found). For this purpose, a method of selection, specifically, a computer graphic approach is to be applied. A new simplified technique of determining the above-mentioned roots on the basis of their direct estimation according to the presented formula is discussed in this work. In addition, accuracy of the obtained results is estimated by a relational error  $\delta \leq 0, 7\%$ . The figure shows the first three roots of the equation of dispersion for the case of standing waves.

#### **UDC 625**

**4.D4.5. A principle of GIS-technology application in track facilities.** /E.Moistsrapishvili, M.Moistsrapishvili, G. Erukidze, N. Arudashvili, I.Mchedlishvili/. Transport and Machine-building. – 2008. – #3(11). – pp. 40-43. – Geo. (res. Rus., Eng.)

The paper considers the necessity of introduction of geographic information systems (GIS) in the sphere of track facilities and the positive aspects of their application. It is noted that when designing the structural organisation of track facilities, together with the development of the control flowcharts, the problems of optimal location of sectoral enterprises and divisions should be solved. The following key problems making the basis for functioning of the GIS program upon design of the structural organisation of track facilities are formulated: creation of a sectoral GIS; creation of a geo-information base; electronic certification, re-engineering and informational support of the rail facilities; computer design (software) of structural organisation of the track facilities.

#### **UDC 607.744.153**

**4.D4.6. Some considerations on the use of geometric transformation in computer engineering graphics.** /A.Shavgulidze, Z.Kvinikadze, G.Shengelia/. Transport and Machinebuilding. – 2008. – #3(11). – pp. 44-51. -Geo. (res.: Rus., Eng.)

It is generally known that a computer program is a sequence of commands, every one of which informs the processor on what to do at the given moment. There are great many computer programs, but most of them are noted for neglecting the concept of an operation and for focusing on the final result. For example, the drawing of a tangent from the given point to the given straight line is accomplished by means of one pictogram, whereas the conceptual side of this operation requires the possession of much more information. Hence, in computer graphics, we often deal with the so-called “disemboweled operations”. The execution of an operation in this way is good only when the engineer is familiar with the full content of the operation is oriented on the result, saving time, and he comprehends adequately what he does by means of a computer. Where necessary, when the operation is to be executed sensibly, the methodology recommended in this work – supplement of the computer program using the intuitive algorithm – is quite expedient.

#### **UDC 656.2/.4:681.5.017**

**4.D4.7. Mathematical description of control regime of track circuits in the existence of intertrack-rail bonds.** /M.Gotsadze, N.Khuchua/. Transport and Machine-building. – 2008. – #3(11). – pp. 142-147. – Rus. (res.: Rus., Eng.)

Presented is a mathematical description of the control regime of track circuits in the existence of intertrack- rail bonds, where, in contrast to the known methods of track circuits' study, specific resistance of mutual inductance between the respective rails of the adjacent tracks is foreseen. Finding of the common solution by the given system of differential equations obtained on the basis of the Kirchoff law is very difficult; therefore, several assumptions that do not affect the practical precision of the solution are made. Besides the grounding conductivity of rails, the design reflects ideal resistances of mutual inductance between the respective rails which enables to resolve the problem of calculating the control regime of track circuits more precisely.

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