14-18
OCTOBER
2019

V INTERNATIONAL CONFERENCE

Information Technologies in
Earth Science and Applications
for Geology, Mining and Economy

ITES&MP-2019

Proceedings of the V International Conference

Содержание / Contents

Предисловие / Preface.....12
Пленарное заседание / Plenary session.....14

Arakelyan A.A., Avagyan A.A., Yeritsyan H.H., Tarasyan N.H., Nersisyan A.H., Uloyan H.R.
OPEN ACCESS TO SPATIAL DATA AND KNOWLEDGE IN EARTH SCIENCES THROUGH VIRTUAL GEOSCIENTIFIC ENVIRONMENT FOR ARMENIA.....15

Chesalov L.E.
NATIONAL DATA REPOSITORY: CHALLENGES AND SOLUTIONS.....16

Emmanuel John M. Carranza, Paulo Miguel Haddad-Martim, Carlos Roberto de Souza Filh.
ANALYSES OF SPATIAL PATTERN OF MINERAL DEPOSITS: EXAMPLES IN THE CARAJÁS MINERAL PROVINCE, BRAZILIAN AMAZON.....16

Levin V.A., Aleksanina M.G.
REGIONAL REMOTE SENSING OF ENVIRONMENT: TECHNOLOGIES AND USERS 17

Lyubushin A.A.
AMBIENT NOISE OF THE EARTH AND TRENDS OF GLOBAL SEISMIC DANGER 17

Ruzhnikov G.M., Klyuchevskii A.V., Paramonov V.V., Mikhailov A.A., Fedorov R.K., Dem'yanovich V.M., Demberel S.
SERVICE-ORIENTED INFORMATION AND ANALYTICAL THE SYSTEM OF ESTIMATION OF INFLUENCE OF THE LITHOSPHERE MODEL ON DYNAMIC PARAMETERS OF ROCKY SOIL OSCILLATIONS FROM EARTHQUAKES OF SOUTHERN BAIKAL REGION 18

Yakubailik O.E., Kadochnikov A.A., Tokarev A.V.
THE SYSTEM OF OPERATIONAL PROCESSING OF SATELLITE REMOTE SENSING DATA IN KRASNOYARSK SCIENCE CENTER OF RUSSIAN ACADEMY OF SCIENCES.....19

Zhizhimov O.L.
DIGITAL REPOSITORIES FOR EARTH SCIENCES.....20

Доклады спонсоров Конференции / Reports of Conference Sponsors

Sergeeva M.A / SCANEX Group (Russia)
REAL-TIME GEOSERVICES TO ADDRESS APPLIED OBJECTIVES.....21

Shulga E.S. / LLC MICROMINE RUS (Russia)
THE ROLE OF GEOLOGICAL AND MINING INFORMATION SYSTEM IN DEPOSIT DIGITAL TWIN CREATION.....22

Научные сессии / Scientific Sessions.....23
Первая сессия / First session 23
Особенности данных в науках о Земле: новые концепции и методы, инструменты их сбора, интеграции и обработки в различных информационных системах, в том числе и в

системах с интенсивным использованием данных. Открытый доступ к научным данным в области наук о Земле / Data peculiarities in Earth Sciences: new concepts and methods, tools for their collection, integration and processing in different information systems, including systems with intensive use of data. Open access to scientific data and knowledge in Earth Sciences.

Aleshin I.M., Ivanov I.D., Koryagin V.N., Perederin F.V., Kholodkov K.I.
GEOPHYSICAL DATA AGGREGATION CENTER "IPE RAS" 24

Ardasenov V.N.
BASIC SPATIAL DATA (BPD): THE ASPECT OF QUALITY ASSESSMENT 24

Bulov S.V., Tkachev A.V., Chesalova E.I.
THE "METALOGENY" GEOPORTAL BY VERNADSKY SGM RAS: STRUCTURE AND FUNCTIONALITY 25

Eremenko A.S.
DEVELOPMENT OF POPULAR-SCIENCE PORTAL "EARTH HISTORY: GEOLOGICAL PERSPECTIVE" 26

Eremenko V.S., Naumova V.V.
COMPUTATIONAL AND ANALYTICAL ENVIRONMENT FOR PROCESSING AND ANALYZING GEOLOGICAL DATA 27

Gusiakov V.K.
OBSERVATIONAL CATALOGS AND DATABASES IN THE STUDY OF NATURAL HAZARDS: PROBLEMS OF THEIR COMPILATION, PARAMETERIZATION AND PRESENTATION 28

Ivanov S.D.
INTERACTIVE REGISTRY OF DATA PROCESSING METHODS FOR GEOCHEMISTRY AND PETROLOGY 29

Lunina O.V., Gladkov A.A.
ON-LINE DATABASE OF PLIOCENE-QUATERANARY FAULTS IN THE BAIKAL REGION AND ADJACENT AREAS 29

Naumova V.V., Eremenko V.S., Platonov K.A., Dyakov S.V., Patuk M.I., Eremenko A.S.
THE MAIN APPROACHES FOR DEVELOPMENT OF THE DIVERSE TERRITORIALLY DISTRIBUTED INFORMATION - ANALYTICAL GEOLOGICAL ENVIRONMENT.....30

Naumova V.V., Platonov K.A., Dyakov S.E., Eremenko V.S., Patuk M.I., Starodubtseva I.A.
BASIC PRINCIPLES OF DEVELOPMENT OF OPEN ACCESS TO DATA OF THE VERNADSKY STATE GEOLOGICAL MUSEUM OF RAS.....31

Patuk M.I.
DIGITAL REPOSITORY GEOLOGYSCIENCE-OPEN ARCHIVE OF SCIENTIFIC INFORMATION ON THE GEOLOGY OF RUSSIA.....31

Platonov K.A.
CONTEMPORARY APPROACHES FOR DESIGNING A SYSTEM OF QUANTITATIVE DATA TABLES INTEGRATION IN GEOLOGY 32

Soloviev A.A., Krasnoperov R.I., Nikolova J.I., Tatarinov I.A.
DEVELOPMENT OF WEB-BASED APPLICATIONS FOR INTERACTING WITH EARTH SCIENCE DATA 33

Viazilov E.D.
DEVELOPMENT OF HYDROMETEOROLOGICAL SERVICES OF ENTERPRISES AND POPULATIONS 33

Zhizhimov O.L.
ABOUT TECHNOLOGY OF EXTRACTION OF GEOGRAPHICAL NAMES FROM TEXT DOCUMENTS 34

Вторая сессия / Second session 36

Анализ данных и математическое моделирование природных процессов в науках о Земле: новые подходы. Эволюция классических ГИС-приложений. Интеллектуальный анализ данных, извлечение фактов и знаний из научных публикаций. / Data mining and mathematical simulation of natural processes in Earth Sciences. Evolution of classical GIS-applications in Earth Sciences. Intelligent data analysis, elicitation of facts and knowledge from scientific publications.

2.1.

Asavin A.M.
NEW METHOD FOR CALCULATION OF THE VALUE OF PROXIMITY OF ORE-OBJECT TO THE STANDARD METALLOGENIC DEPOSIT TYPE AND VISUALIZATION THIS PARAMETER BY GIS TECHNOLOGIES 37

Ashraf S. Abdelmaksoud.
STRESS CONFIGURATION FROM FRACTURE ANALYSIS OF JOINTED SUDR CHALK IN WADI ARABA, EASTERN SIDE OF THE SUEZ RIFT, EGYPT 37

Chesalova E.I., Asavin A.M.
MONITORIONG OF GAS EMMISSION DURING MINING ACTIVITY IN ARCTIC REGION BY WSN NETWORK EQUPMENT 38

Chetyrbotsky A.N.
FORMATION OF LAYERED STRUCTURE IN A GAS-DUST CLOUD 38

Gorshkov A.I., Novikova O., Livinsky A.
RECOGNITION OF ORE-BEARING NODES IN THE ALTAI-SAYAN REGION 39

Ivanov S.D., Aleshin I.M., Buro V.A., Ochelkov J.P.
NOWCASTING OF GEOEFFECTIVE PROTONS 40

Ivanov I.D., Aleshin I.M., Koryagin V.N., Osika V.I., Pavlov E.I., Perederin F.V., Kholodkov K.I.
REALTIME STRUCTURE HEALTH MONITORING SYSTEM 40

Kh. G. Elmaadawy
THERMAL MATURITY OF THE DEVONIAN SOURCE ROCKS IN ASTRAKHAN ARCH, SOUTHWESTERN PART, PRECASPIAN BASIN, RUSSIAN FEDERATION.41

Kutinov Y.G., Chistova Z.B., Polyakova E.V., Mineev A.L.
GEOMORFOMETRIC SETTINGS OF TECTONIC NODES AS POSSIBLE SEARCH SINGS PROMISING AREAS FOR OIL AND DIAMONDS.....41

Malygin I.V., Aleshin I.M.
MACHINE LEARNING APPROACH IN PROBLEM OF 3D IMAGING WITH 1D-PROFILES 42

Mouradian M. Karapet
GEODINAMIC MODEL OF LITHOSPHERE AND METALLOGENY OF ARMENIAN HIGHLAND (ANATOLIAN) – LESSER CAUCASIAN-IRANIAN REGION (CENTRAL MEDITERRANIAN MEZOCENOZOIC DIVERGENT AND CONVERGENT SYSTEMS).....42

Nikolova J.I.
STUDY OF THE DIRECTIONAL VARIATIONS OF THE EARTH'S MAGNETIC FIELD ACCORDING TO DATA FROM OBSERVATORIES AND VARIOMETERS NETWORKS.....43

Polyakova E.V., Kutinov Y.G., Chistova Z.B., Mineev A.L.
DIGITAL ELEVATION MODELING IN THE GEOECOLOGICAL RESEARCHES OF THE NORTHERN TERRITORIES OF THE COUNTRY.....43

Riabova S.A.
INVESTIGATING MULTIFRACTALITY OF GEOMAGNETIC VARIATIONS BASED ON WAVELET TRANSFORM MODULUS MAXIMA METHOD 44

Delchini S., El Mendili A., Bui T., Lefevre T., Maestracci B., Orberger B., Pilliere H., Bourrat X., Le Guen M.
THE SOLSA CORESCANNER: AN AUTOMATIZED MULTIFUNCTION ANALYTICAL TOOL FOR ON-SITE DRILL CORES ANALYSIS IN LATERITIC ENVIRONMENT.....45

Sakharov J.A., Mingalev O.V., Mingalev I.V., Merzliy A.M., Tikhonov V.V., Trekin V.V., Janakov A.T.
METHODS FOR ASSESSMENT AND PREDICTION OF THE GEOPHYSICAL ENVIRONMENT FOR SPECIALIZED INFORMATION SYSTEMS 46

Samokhina O.O., Rybkina A.R., Presnyakov S.V.
A DIGITAL DEMONSTRATION COMPLEX WITH A SPHERICAL SCREEN UNDER ORBUS 2.0 SOFTWARE: NEW PROJECTION TECHNOLOGIES FOR EARTH SCIENCES POPULARIZATION.....46

Sergeyeva N.A., Zabarinskaya L.P., Nisilevich M.V.
GEOMAGNETIC DATA IN THE WORLD DATA CENTER *FOR SOLAR-TERRESTRIAL PHYSICS* 47

Tarasyan N.H., Avagyan A.A., Mkrtumyan A.A. , Yeritsyan H.H., Arakelyan A.A.
ON THE SOFTWARE OF LANDSLIDE REAL-TIME AUTOMATED MONITORING SYSTEM 47

Tarshan Ahmed Ramadan Mohamed
3-D PETROLEUM SYSTEM MODELING OF THE EASTERN SECTOR OF THE GULF OF SUEZ EGYPT 48

Vahrushev A.M., Fedorenko S.V., Muravyov V.S.
HETEROGENIOUS DATA AND SOFTWARE USE FOR RUSSIAN MINERAL RESOURCES COMPLEX MONITORING AND ANALYSIS 49

2.2.

Antonets A.V., Vakhruchev A.M., Muravyev V.S.
THE USE OF GIS FOR EVALUATION OF TRANSPORT ACCESSIBILITY FOR THE MINERAL PROSPECTIVE SITES WITHIN THE TERRITORY OF THE ALTAI-SAYAN FOLDED AREA (RUSSIA) 50

Ezra Kavana
GEOLOGICAL MAPPING, STRUCTURAL SETTING AND PETROGRAPHIC DESCRIPTION OF THE ARCHEAN VOLCANIC ROCKS OF MNANKA AREA, NORTH MARA 51

Gladkov A.A., Lunina O.V.
GEOINFORMATION MODELING OF DANGEROUS GEOLOGICAL PROCESSES WHICH ARE CAUSED BY EARTHQUAKES 51

Golubenko I.S., Goryachev N.A.
BANK OF GEOSPATIAL INFORMATION OF THE GEOLOGICAL STRUCTURE OF THE TERRITORY MAGADAN REGION (NORTHEAST OF RUSSIA) 52

Koshkarev A.V.
RUSSIAN NSDI: TWENTY YEARS LATER 53

Odintsova A., Rybkina A.
ROSA GIS PROJECT: DATABASE AND WEB SERVICE 53

Sidorova I.P.
INTEGRATED GEOPHYSICAL GIS&RS MODELS OF THE DEEP STRUCTURE OF THE ORE DEPOSITS IN WESTERN UZBEKISTAN 54

Tuzhikov M.E.
METHODS AND TECHNOLOGIES OF SPATIAL DATA VISUALIZATION 54

2.3.

Braginskaya L.P., Grigoruk A.P., Kovalevsky V.V.
INTELLECTUAL SUPPORT OF SCIENTIFIC RESEARCH IN ACTIVE SEISMOLOGY 55

Kuvshinova L.A., Kuvshinova K.A., Klimentsova N.I.
A MODEL OF DEVELOPMENT OF A KNOWLEDGE BASE ON THE BASIS OF FORMAL PROCESSING OF DESCRIPTIVE INFORMATION 56

Massel L.V., Ivanova I.Yu., Zarodnyuk M.S.
METHODS AND INFORMATION TECHNOLOGIES FOR ASSESSING THE ENERGY SECTOR EFFECT ON GEOECOLOGY TAKING INTO ACCOUNT THE QUALITY OF LIFE 56

Molorodov Y.I.
DEVELOPMENT OF INFORMATION SYSTEM BASED ON ONTOLOGICAL DESIGN PATTERNS 57

Третья сессия / Third session 59
Применение методов и технологий дистанционного зондирования в науках о Земле и горной промышленности: от спутников до беспилотных летательных аппаратов / Application of methods and technologies of the remote sensing in Earth Sciences: from satellites to unmanned aerial vehicles.

Chistova Z.B., Kutinov Y.G.
SEARCHING MATRIX TECTONIC NODES NORTH OF RUSSIAN PLATES ON GROUND AND SPACE DATA.....60

Eremenko A.S., Belousova K.S.
TROPICAL CYCLONE CENTER POSITION ENHANCEMENT USING VERTICAL ATMOSPHERIC PROFILES 60

Ermakov D.M.
DEVELOPMENT OF THE CLIMATOLOGICAL DATABASE OF ATMOSPHERIC RIVERS.....61

Fedoseeva N.V., Lopuha V.O.
USE OF PRINCIPAL COMPONENT ANALYSIS METHOD FOR ANALYSIS OF CLOUD STRUCTURE OF POLAR CYCLONES BY THE MULTISPECTRAL SATELLITE DATA OF MODIS AQUA / TERRA.....61

Ivanchenko G.N., Gorbunova E.M.
STUDY OF THE FAULT ZONES STRUCTURE BY THE REMOTE SENSING DATA 62

Kadochnikov A.A., Tokarev A.V., Yakubailik O.E.
THE SOLUTION OF THE PROBLEM OF RAPID ASSESSMENT OF AIR POLLUTION BASED ON GEOPORTAL ICM SB RAS 62

Kholodkov K.I., Aleshin I.M.
EVERGREEN FRAMEWORK FOR GREIS-RAW DATA MANIPULATION 63

Kholodkov K.I., Ivanov S.D., Aleshin I.M., Burov V.A., Ochelkov J.P.
VISUALIZING SPACE WEATHER MONITORING SERVICE.....64

Muravyev V.S., Bondarenko N.V., Gvozdeva I.A.
APPLICATION OF REMOTE SENSING DATA (ERS) FOR MAPPING OF STRUCTURAL ELEMENTS, CONTROLLED GOLD MINERALIZATION ON THE EXAMPLE OF PROSPECTIVE AREAS IN THE SAHA (YAKUTIA) AND MAGADAN REGION (RUSSIA) 64

Perederin F.V., Aleshin I.M., Ivanov S.D., Kholodkov K.I.
FIELD TEST OF GNSS-DATALOGER 66

Четвертая сессия / Fourth session 67

Применение информационных технологий в области металлогении критических полезных ископаемых; социальные аспекты горно-геологической отрасли; прогнозные построения в области геологической разведки и землепользования / Application to Critical Raw Materials (CRM); social aspects of mining (e.g., the Social Licence to Operate [SLO]); predictive mapping and applications to exploration, landuse and search for extensions of known deposits.

Fatyanov A.G.
THE EXPRESS METHOD FOR THE SEARCH FOR OBJECTS OF THE PRESENCE OF OIL AND GAS WITH USING REGULARIZATION 68

Gourcerol B., Kontak D., Petrus J.A., Lach P.
ASSESSING MULTI-STAGE ORE FORMING PROCESSES USING LA ICP-MS SULPHIDE ANALYSIS IN OROGENIC GOLD DEPOSITS AND APPLICATIONS TO EXPLORATION 68

Klebanov D.A.
DIGITALIZATION OF MINING INDUSTRY 69

Lahfid A., Delchini S., Baudin T.
THE USE OF THE RSCM GEOTHERMOMETRY FOR MINING INDUSTRY 70

Millot R., Gloaguen E., Sanjuan B.
LITHIUM ISOTOPIC GEOCHEMISTRY AND GEORESOURCES: RECENT APPLICATIONS AND FUTURE DIRECTION 70

Millot R., Ibrahim H., Lafaurie N., Gourcerol B., Melleton J., Conte T., Ghestem J.P.
HYDROGEOCHEMICAL INVESTIGATION OF GOLD IN SURFACE WATERS BY THE USE OF INTEGRATIVE AND PASSIVE SAMPLERS: PROOF OF CONCEPT ... 71

Maysyuk E.P., Ivanova I.Yu., Izhbuldin A.K.
APPROACH TO ASSESSING THE IMPACT OF THE FUNCTIONING OF ENERGY OBJECTS ON THE GEOECOLOGY OF COASTAL AREAS OF LAKE BAIKAL 71

Berezina O.A., Maksimovch N.G., Meshcheriakova O.Yu.
THE USE OF GIS FOR MINIMIZATION OF THE TECHNOGENIC IMPACT ON THE ENVIRONMENT (ON THE EXAMPLE OF THE KIZEL COAL BASIN) 72

Cheremisina E.N., Finkelstelstein M.Ya., Spiridonov V.A.
RUSSIAN GEOINFORMATION SYSTEM INTEGRO: APPLICATION IN GEOLOGICAL RESEARCH 73

THE USE OF GIS FOR MINIMIZATION OF THE TECHNOGENIC IMPACT ON THE ENVIRONMENT (ON THE EXAMPLE OF THE KIZEL COAL BASIN)

Berezina O.A., Maksimovch N.G., Meshcheriakova O.Yu.

Institute of Natural Sciences of Perm State National Research University (Russia)

berezina.olga16@gmail.com, olgam.psu@gmail.com

The Kizel coal basin (KCB), located in the east of the Perm Region (Russia), has been developed for more than 200 years.

The territory of the KCB is characterised with complex mining conditions determined first of all by high watering and intensive amount of karst in rocks and high sulphide sulfur concentration.

The shutdown of mines at the end of the XX century entailed a number of environmental problems, the main of which are spills of acid mine water, up to 75 million m^3 / year (with an average value of 15-25 million m^3 / year), with a content of iron, aluminum, manganese, beryllium hundreds and thousands of times higher than MPC at pH 2-3.

The results of long-term monitoring were integrated in a problem-oriented basin geoinformation system published in the public domain (http://kub.maps.psu.ru).

The main purpose of the developed web-GIS is to organize monitoring and support the adoption of managerial decisions aimed at improving the environmental situation. The web-GIS of the KCB is based on the basin principle, in which river catchments are used to assess the state of ecosystems in the study area. Based on the GIS, geofiltration models were built and a set of recommended measures to minimize and eliminate spillage of mine water was developed.

A comprehensive restoration of the natural environmental components of the territory of the KCB, in accordance with the proposed measures, will significantly improve the overall ecological situation, positively affect the socio-economic conditions of the territory and significantly increase the tourist and investment attractiveness of the region.

The reported study was funded by RFBR and Russian Geographical Society according to the research project № 17-05-41114 и 17-45-590793.

Кизеловский угольный бассейн (КУБ), расположенный на востоке Пермского края (Россия), разрабатывался более 200 лет.

Территория КУБа отличается сложными горно-геологическими условиями, в первую очередь, высокой обводненностью и интенсивной закарстованностью пород, а также высоким содержанием сульфидной серы.

Прекращение работы шахт в конце XX века повлекло за собой ряд экологических проблем, основной из которых являются изливы кислых шахтных вод, объемом до 75 млн $м^3$/год (при среднем значении – 15-25 млн $м^3$/год), с содержанием железа, алюминия, марганца, бериллия в сотни и тысячи раз превышающим $ПДК_{хп}$ при pH 2–3.
Полученные результаты многолетнего мониторинга были интегрированы в проблемно-ориентированной бассейновой геоинформационной системе, опубликованной в открытом доступе (http://kub.maps.psu.ru).

Основное назначение разработанной веб-ГИС – организация мониторинга и поддержка принятия управленческих решений, направленных на улучшение экологической ситуации. В основу веб-ГИС КУБа положен бассейновый принцип, при котором для оценки состояния экосистем исследуемой территории используются водосборы рек. На основе ГИС были построены геофильтрационные модели и разработан комплекс рекомендуемых мероприятий по минимизации и ликвидации изливов шахтных вод.

Комплексное восстановление природных компонентов окружающей среды территории КУБа, в соответствии с предложенными мероприятиями, позволит существенно улучшить общую экологическую обстановку, положительно повлияет на