

**ABOUT CORRELATION ANALYSIS OF CHEMICAL COMPOUND OF
ATMOSPHERIC PRECIPITATION IN THE NORTH OF THE RUSSIAN
PLAIN**

Dinara Khayrullina

Department of Landscape Ecology, Institute of Ecology and Geography/Kazan Federal University, **Russia**

ABSTRACT

The paper deals with estimation of spatial and temporal variability of magnitude and number of statistically significant coefficients of correlation between components of chemical compound of atmospheric precipitation in the North of the Russian plain. There is direct relationship between magnitude of correlation coefficients and chemical composition of atmospheric precipitation. For example, in space aspect the greatest number of significant correlation coefficients meets on coastal and city continental weather stations. Finally, in temporal (seasonal) aspect this regularity is observed in May, i.e. ion concentration increases in the air during the season of photochemical activity.

Keywords: atmospheric precipitation, aerosols, condensation nuclei, chloride ions, correlation analysis, statistically significant correlation coefficient, weather station

AN EXPLORATORY ANALYSIS OF PM₁₀ PARTICULATE MATTER RELATIONSHIPS WITH WEATHER DATA AND SPATIAL VARIATION

Assoc. Prof. Dr. Daniel Dunea

Valahia University of Targoviste, **Romania**

ABSTRACT

The main aim of the paper was to explore the interrelationships between PM₁₀ time series and various weather parameters i.e. air temperature, atmospheric pressure, relative humidity, solar radiation, and wind speed, recorded hourly at six automated monitoring stations located in Oltenia South-West region of Romania. Significant correlations ($p < 0.001$) were observed between PM₁₀ concentrations and air temperature, PM₁₀ and atmospheric pressure, and PM₁₀ and wind speed at all stations. These associations were not dependent on monitoring location, and provided reliable PM₁₀ concentrations tendencies according to weather parameter's change. PM₁₀ concentrations increased with temperature abatement, increased with atmospheric pressure rising, and decreased with wind speed enhancement. A case study performed in Targoviste city is presented to supplement the knowledge on PM₁₀ spatial variation. Resulted thematic maps with isolines showed high levels of PM₁₀ particles in the western and northwest parts of the city, which are correlated with intense heavy traffic and neighboring active industries from northwest. Geo-referenced PM₁₀ quantitative knowledge facilitates the selection of control strategies for reducing exposure risks for the inner-city residents.

Keywords: particulate matter, weather data, correlation, concentration isolines

ANALYSIS OF NO_x AIR QUALITY INDICATORS IN URBAN AREAS OF CLUJ COUNTY, ROMANIA

Assoc. Prof. Dr. Adina-Eliza Croitoru¹

Lecturer Dr. Răzvan Horațiu Băținaș¹

Dipl. Eng. Dr. Liana Mureșan²

¹ Babeș-Bolyai University, Faculty of Geography, **Romania**

² Cluj Environmental Protection Agency, **Romania**

ABSTRACT

The urban air quality is one of the most important issues has attracted the attention of many researchers worldwide because it's strong impact on human health. The present study is focusing on some important air quality indicators, in Cluj County, Romania: nitrogen oxides (NO, NO₂, NO_x). The data have been collected in five measurement points located in two different cities in Cluj County: four points in Cluj- Napoca and one in Dej. Cluj-Napoca is one of the most important city of Romania, with more than 320,000 inhabitants, while Dej was one of the most industrialized city of Cluj County, which has about 33,000 inhabitants. The recordings were extended over a period of 5 years (2009 – 2013), with daily data coverage. The data were obtained by using the chemiluminescence technique for all five points. The main results are: the highest concentrations have been recorded during the cold half of the year (October - March) when exceeding of the maximum allowed values may occur, associated to specific weather condition (low thermal inversions) and heating systems; the most polluted spots were identified in Cluj-Napoca city, in the industrial and high traffic areas.

Keywords: NO_x, air quality, Cluj, Romania

APPLICATIONS OF LIFE CYCLE ASSESSMENT (LCA) IN SHIPPING INDUSTRY

Associate Professor Dr.Eng. Florin Nicolae¹,

Associate Professor Dr. Cătălin Popa²,

Professor Dr. Eng. Haralambie Beizadea¹,

¹ Faculty of Navigation and Naval Management, Naval Academy Mircea cel Batran, Constanta,
Romania

² Higher Colleges of Technology, ADMC Business Faculty, Abu Dhabi, **United Arab Emirates**

ABSTRACT

The paperwork is approaching different aspects related to the environment dimensions within the life cycle assessment of a ship. This scientific endeavors take under consideration environment issues related to the commercial ships, seen as a complex systems, integrated in economic and technical cycles, in line with shipbuilding and repairing shipyards, naval transports (maritime and riverine), port activities and its correlative activities. Thus, ships life cycle has been decomposed in successive or overlapping stages, as designing, building, exploiting and scrapping phases. For our LCA purposes was used Solid works software was chosen a ship model and a route, defined as work hypothesis. The proposed solutions are to lead to the impact decreasing against the environment, by optimization raw materials and energy consumption and by recycling processes incentive as to the end of operating processes.

Keywords: LCA (Life Cycle Assessment), shipping industry, sustainable development

ASSESSMENT OF THERMAL COMFORT INSIDE VEHICLES – AN EXPERIMENTAL EVALUATION

Lecturer Dr. Croitoru Cristiana ¹

Lecturer Dr. Vartires Andreea ¹

PhD student Dogeanu Angel ¹

Lecturer Dr. Bode Florin ²

Assoc. Prof. Dr. Nastase Ilinca ¹

Dr. Iatan Alexandru ¹

¹CAMBI Research Centre, Technical University of Civil Engineering Bucharest, **Romania**;

²Technical University of Cluj-Napoca, **Romania**

ABSTRACT

Vehicular fuel consumption and its environmental impact can be reduced significantly with advanced climate control systems that intelligently deliver conditioned air, and use more efficient diffusion. However, there is a continuing need developing thermal comfort models and evaluation methods for these systems. The objective of this study was to investigate the thermal comfort inside the vehicle, analyzing the airflow around thermal manikins and evaluating thermal comfort indices. Two thermal manikins were used to evaluate thermal comfort inside a vehicle. We simulate two passengers and their interaction with the environment. The temperature of the manikins is controlled, generating a thermal plume similar of the passengers inside the cabin. Velocity and temperature measurements help evaluating the indoor air quality and airflow, allowing to evaluate the thermal comfort index: PMV. Comparison with personal thermal comfort assessment was completed. The results permit the evaluation of indoor thermal comfort and the discrepancy in application of standard thermal comfort indices, unadapted to transient conditions as found in the vehicles.

Keywords: thermal manikin, thermal comfort in vehicle, cabin airflow, PMV index

CHANGES IN HOT EXTREME TEMPERATURE INDICES IN CARPATHIAN AND INTRA-CARPATHIAN AREAS OF ROMANIA

Assoc. Prof. Dr. Adina-Eliza Croitoru¹

Dr. Adrian Piticar¹

¹Babeş-Bolyai University, Faculty of Geography, **Romania**

ABSTRACT

Changes in daily extremes events is one of the most important topic in climate literature and many studies have been conducted so far at local or regional scale worldwide. For the Romanian territory, only little research on this issue was done. In this article, the Carpathian and intra-Carpathians regions of Romania were considered. This study is focused on analyzing the trends of daily extreme temperature indices at a regional scale over a period of 50 years: 1961–2010. Data sets of daily minimum and maximum temperature recorded in 10 weather stations were analyzed. The main goal was to find changes in daily extreme temperatures by using a set of 9 indices adopted from the core indices developed by ETCCDMI with appropriate modifications to suit to the analyzed territory. The main results suggest that the climate has become warmer during the last decades. Trends of extreme temperature indices at the regional scale of Carpathians and intra-Carpathians areas are increasing for most of the indices calculated. It has been identified that both extreme daily maximum and minimum temperatures indices have increased in the analyzed areas. For all the indices related to hot temperature most trends are statistically significant.

Keywords: daily extreme temperature indices; daily maximum and minimum temperatures; trend; Mann-Kendall test and Sen's slope; Carpathian and intra-Carpathian areas of Romania

**CLEAN TECHNOLOGIES DEVELOPMENT STRATEGY
FOR THE NATIONAL BLACK CARBON CONTROLLING SYSTEM
IN THE RUSSIAN ARCTIC**

Assoc. Prof. DSc. Valery M. Abramov

Assoc. Prof. DSc. George G. Gogoberidze

Prof. DSc. Lev N. Karlin

MSc. Julia A. Lednova

MSc. Nikolaj N. Popov

Russian State Hydrometeorological University, Arctic and Subarctic Institute, **Russia**

ABSTRACT

We draw the strategy for development of basic clean technologies that have to be used within national black carbon management system in the Russian Arctic. Black carbon is the significant short-lived climate forcer and it has to be under global control. The main black carbon sources (transport, energy, industry, biomass burning, wildfires) are outside the Arctic. Migration of black carbon to the Arctic from the emission areas is due to the general atmospheric circulation. Therefore, the management system of black carbon content in the Arctic must be global. Today such a system is missing. In the current geopolitical conditions, such a system should consist of national systems for national responsibility areas of the Arctic countries (Russia, Canada, USA, Denmark and Norway). These national systems should be aimed at the control of emissions of black carbon, on the operational measurements of its concentration in the atmosphere, the definition of patterns and scenarios of its penetration into the Arctic, and also on decision making support in the field of regulation at the national level. Another task is the coordination of national systems for ensuring the effective functioning of the global control system for black carbon in whole. Development and introduction in practice of these basic technologies will have a stimulating effect on the market of environmental goods and services. The Ministry of education and science of Russia provided financial support for this research with the state order 2014/166 and state contract 14.515.11.0002.

Keywords: climate change and variability, air management, particulate matter, black carbon, decision support systems

**CLIMATE RECONSTRUCTION TECHNIQUE BASED ON GEOCHEMICAL
TIME SERIES OBTAINED FROM BOTTOM SEDIMENTS (TELETSKOE
LAKE, SOUTH SIBERIA) FOR THE LAST 1500 YEARS**

Assoc. Prof. Dr. Ivan Kalugin

Dr. Andrey Darin

Dr. Valeriy Babich

V.S. Sobolev Institute of Geology and Mineralogy SB RAS, **Russia**

ABSTRACT

The bottom sediments were studied as a source material for the mathematical treatment. 10 geochemical parameters: Ca, Ti, Mn, Fe, Br, Br / Rb, Br / Sr, Br / Y, Co / Inc, Sr / Rb were considered. The elements content were measured by X-ray fluorescence analysis on synchrotron radiation (SR XRF, BINP) along the entire length of the sediment core (1974 mm) with 1mm step. Matrix of the geochemical time series was built taking into account continuous sedimentation at an average accumulation rate of 1.06 mm/year in the time interval AD 530-2010 years. Reconstruction of target parameters (temperature, precipitation and "climate type", lake level) made by three methods - regression, discrimination and nearest neighbor realizing different approaches to the problem to be solved.

Keywords: Geochemical time series, paleoclimate, reconstruction, mathematical treatment

COMPARISON OF MODELED AND OBSERVED RESULTS FOR TEMPERATURES AND PRECIPITATIONS OVER BULGARIA

Assoc. Prof. Dr. Todor Todorov,

Assis. Eng. Krastina Malcheva,

Tihomir Denev

National Institute of Meteorology and Hydrology (NIMH), **Bulgaria**

ABSTRACT

The use of climate models, global or regional, is a modern approach to diagnose and predict the different weather and climate variables. Models become more and more comprehensive in the parameterization of the physical processes in the atmosphere and accurate in computation of wind, temperature, precipitation, radiation and other fields and flows.

The regional climate model RegCM, version 4.4rc8, is used in this work to calculate the mean monthly temperatures, monthly maximum and minimum extreme temperatures as well as monthly total precipitations for years 2000 and 2005. They are compared with the observations at 19 stations, situated in different climate regions over Bulgaria. For this purpose the model (in a sub-grid mode with horizontal grid step 10 km) is used after some adjustments towards input parameters used, mainly in the choice of different cumulus convection parameterization schemes, in order to obtain better results for representations. The comparison shows that the model needs of further adjustment in order to improve the results. This requires sensitivity experiments, including global dataset change. The model uses the initial and boundary condition from the global climate models, in this case the re-analyses from E15 dataset. Some of the results are presented in figures using the visualization package GrADS.

Keywords: regional climate model, sub-grid modeling, climate, comparison, temperature, precipitation, extreme

CORRELATION ANALYSIS OF REFRIGERATION SYSTEMS FAILURES IN POLISH FISHING VESSELS

Prof. PhD. Katarzyna Gawdzińska

MSc Waldemar Kostrzewa

PhD. Grzegorz Nicewicz

Maritime University of Szczecin, **Poland**

ABSTRACT

Refrigeration systems of fishing vessels have a similar impact on the natural environment as refrigeration devices applied in remaining economy sectors. Adopting a principle of estimating equipment costs in the entire operation period, it must be stated that environment impact appears in all installation lifetime stages, from its elements production moment, through assembly, startup, operation, repairs, shutdown and liquidation. Fundamental elements of the environmental impact are impoverishing ozone layer in the ionosphere, gas emission, smog production in the lowest atmospheric layers, soil and waters acidity change as well as natural water reservoirs eutrophication.

As a result of international actions the refrigeration industry tries to limit its harmful impact on natural environment by introduction of new refrigerant and design solutions of refrigeration installations. An integrated approach to the issue includes:

- installation design choice and refrigerant selection;
- procedures choice, responsible for safe refrigerant operation;
- introduction of technology reducing leaks and increasing installation efficiency;
- promotion of the latest knowledge and staff training, responsible for designing and operation;
- predicting and estimating possible refrigeration systems elements failures for prevention and repair purposes.

These issues remain in the interest of centers responsible for implementation of environment-friendly solutions in the refrigeration.

The paper presents the correlation analysis of failures occurred in the refrigeration systems of Polish fishing vessels in 2007-2011 years. Analysis results described in the paper can be a base to draw up guidelines, both for designers as well as operators of the marine refrigeration systems to avoid the harmful impact on ozone layer and natural environment.

Keywords: failures, fishing vessels, refrigeration systems, harmful impact on ozone layer

**DETERMINATION OF CRITERIA WEIGHTS VALUES FOR WIRELESS
SENSOR NETWORK ORIENTED ON MONITORING OF AIR POLLUTANTS
RELATED TO TRAFFIC**

Vendula Hejlová

Palacký University in Olomouc, **Czech Republic**

ABSTRACT

Air pollution is a serious problem all around the world. The highest contribution to rising emissions in the air is caused by burning of fossil fuels and transportation. Road traffic is a big problem in cities and developing countries where the number of cars is increasing. The major pollutants which are related to transportation are NO_x, CO_x and VOC. It is necessary to monitor the values of these pollutants because they have to be held below their highest allowed limits. Wireless sensor network seems to be a good technology for measuring values of air pollutants in cities. Every wireless sensor network consists of (wireless) nodes equipped with needed sensors, gateway and server. The biggest advantage of this technology is that data are collected in a real time so that the most endangered areas can be warned in time. Nodes can be distributed in the area of interest with high density so that detailed information about air pollutants is obtained. Data obtained by sensors, recorded in nodes are sent to a gateway and resent to a server for a long time storage.

This study focuses on usage of wireless sensor networks for monitoring of air pollutants related to traffic. Criteria for the selection of nodes with integrated demands on needed sensors were determined and evaluated by their importance. The optimal parameters for application of this kind of wireless sensor network were specified. Weight values of the selected criteria were established on the basis of four methods. The computed values of weight for determined criteria were compared and visualized. The most appropriate method for this kind of task was chosen. Determination of criteria and their weight values is a basis for selection of the most suitable nodes, sensors for determined task.

Keywords: Wireless Sensor Network, Criteria, Air Pollutants, Weight Determination

EVALUATION OF NATIONAL EMISSIONS FROM THE INDIVIDUAL HEATED DWELLINGS

Assoc. Prof. Dr. Irina Meghea¹

Dr. Adriana Bors²

Chem. Carmen Munteanu²

¹ POLITEHNICA University of Bucharest, Faculty of Applied Sciences, Department of Mathematical Models and Methods, **Romania**

² National Research & Development Institute for Environment Protection, Bucharest, **Romania**

ABSTRACT

The individual heating facilities in residential and non-residential areas are emission sources that give important weight to the national emission of fine particulates. Modernization and thermal rehabilitation of dwellings has as main goals the improvement of thermal isolation performances of building elements which delimit from exterior the internal heated spaces, as well as the increase in energy efficiency of thermal plants afferent to dwellings. The aim of rehabilitation of heating supply systems for warm water and food preparation for dwellings and social cultural buildings is to assure the energy consumption by diminishing energy and thermal agent losses, reduction of pollutant emissions, import decreasing of energetic materials, increasing thermal confort conditions.

The paper contains a description of peculiarities in the evaluation of atmospheric pollutants from dwellings located in different zones of the country. The results of research for finding out a computational method to evaluate emissions of atmospheric pollutants using „bottom-up” procedure are presented. The computational method developed represents a useful tool for the extension of the investigation to the prediction of emission values so as to make possible the elaboration of an action plan and to establish technical solutions that are to contribute to a sound living level on medium and long terms.

Keywords: individual heating, atmospheric pollutants, dwellings insulation, fossil fuels, heat transfer

EVALUATION OF THE REGIONAL AIR QUALITY EFFECTS OF ISTANBUL CEBECİ QUARRY AND CRUSHING-SIFTING FACILITIES IN TERMS OF PM₁₀ AND SO₂ CONCENTRATIONS

Edip Avşar¹

Ertugrul Kaya²

İlker Akmirza³

Ezgi Erdogan³

Abdullah Çubukçu⁴

¹ Çanakkale Onsekiz Mart University, Çanakkale -Turkey

² Okan University, Istanbul - Turkey

³ Istanbul Technical University, Istanbul - Turkey

⁴ Istanbul Metropolitan Municipality, Istanbul – Turkey

ABSTRACT

This paper aims to determine the air quality effects of 15 quarries with 108,000 tons per day capacity located in İstanbul Cebeci region. South, east and west site of the quarries are surrounded by settlement areas and residential premises that approximately population of 485,000 people. Due to the high capacity of the facilities and there are large settlements nearby, it is important to determine their air quality effects on the region. For this purpose, PM₁₀ and SO₂ measurements were made at a representative point and the results were evaluated between the dates of 27th July and 22nd October 2012; and 1st April and 16th July 2013. According to results, in terms of SO₂ there was no determined effect on air quality. On the other hand, in terms of PM₁₀ parameter, the results indicated that the measured levels are 3-5 times higher than the other points in İstanbul at the same timespan. During the 112 days of measurements, PM₁₀ parameters have exceeded the European Union threshold value of 50 µg/m³ for 106 days, and exceeded the Air Quality Evaluation and Management Regulation's 2012 Turkey threshold value of 180 µg/m³ for 57 days. During the 76 days of measurements, PM₁₀ pollution parameters have been exceeded the European Union threshold value of 50 µg/m³ for 74 days, and exceeded the Air Quality Evaluation and Management Regulation's 2013 Turkey threshold value of 140 µg/m³ for 60 days. These results indicate us, unsupervised operation of the facilities negatively effect on the region air quality and the health state of the people live in the region.

Keywords: PM₁₀, SO₂, air quality, quarry

HABITATION QUALITY EVALUATION MODEL

Prof. Dr. Eng. Lidia Niculita¹

Assist. Prof. Dr. Eng. Florinela Ardelean¹

Prof. Dr. Cristian Ioja²

¹ Technical University of Civil Engineering Bucharest, Faculty of Engineering Installations, **Romania**

² Bucharest University, Faculty of Geography, **Romania**

ABSTRACT

This article presents the results of support research, done in order to develop environment management systems, based on an evaluation model of environment quality in current and future habited areas, which would lead to impact reduction of waste products on the environment and improvement of habitation quality in residential areas, by using scientific models and methods. Knowing the fact that waste sources are greenhouse effect generators, the possibility of developing some economic mechanisms appear, mechanisms that have the purpose of adapting residential areas to current climate change. The elaborated evaluation model regarding environment quality within urban residential areas is a mathematical model, based on reality and generalization, by emphasizing some cause – effect relations, can be considered an instrument for improving the quality of life in urban ecosystems and it's built using a multi criteria analysis. The categories of factors that influence the realization of the habitation quality model are also emphasized. Finally, the results of applying the model are presented through the realization of a case study for a representative urban congestion – Bucharest metropolis.

Keywords: interior air quality, thermal comfort, residential building, habitation model

HEAT WAVES AND THEIR ESTIMATED SOCIO-ECONOMIC IMPACT IN BUCHAREST CITY, ROMANIA

Assoc. Prof. Dr. Adina-Eliza Croitoru¹

Assoc. Prof. Dr. Raluca Ioana Antonie²

Prof. Assist. Adina Rus³

¹Babes-Bolyai University, Faculty of Geography, **Romania**

²Babes-Bolyai University, Faculty of Political, Administrative and Communication Sciences, **Romania**

³Babes-Bolyai University, Faculty of Economics and Business Administration, **Romania**

ABSTRACT

Heat waves are one of the most important extreme phenomena that are subject to important changes under present global warming conditions. In this study a complex analysis of heat waves over a period of 53 year (1961-2013) was performed. Daily maximum temperature data have been used in order to detect the heat waves based on 95th percentile threshold. Then the annual series of number of heat waves, their mean and maximum duration, as well as their cumulated duration have been constructed. The four series were then subject to trend detection by employing Mann-Kandall and Sen's slope methods. The main results are: statistically significant increase was detected in all four parameters time series considered; the maximum annual values of the parameters are about four times higher compared to the mean annual number calculated for the entire period. The estimated social and economical impact is important to be determined in terms of response at community level, institutional level as well as at individual level. The impact could first imply modification regarding the consumption of electricity and major differences in the daily consumption basket. Also, as a direct consequence of heat waves it is expected the hospitalization costs increase due to the number of heat induced casualties and a decrease in the work performance resulting in an estimated loss in Gross Domestic Product.

Keywords: heat waves, trend, socio-economical impact, Bucharest city, Romania

**HOW PROTECTED ARE WE INDOOR?
INDOOR AIR POLLUTION WITH PARTICULATE MATTER IN AN OFFICE
BUILDING FROM BUCHAREST**

Elena Bucur, Mihaela Petrescu,

Gabriela Vasile, Luana Pascu, Raluca Diodiu

National Research and Development Institute for Industrial Ecology – INCD ECOIND,
Bucharest, **Romania**

ABSTRACT

This paper presents the results of an indoor air quality monitoring study conducted in an office building located on the outskirts of Bucharest, in an area characterized by low traffic and no major industrial pollution sources, during the summer of 2013, from 14th of June to 3rd of July. The aim was to determine the concentration of particulate matter dimensional fractions PM_{2.5} (particulate nominal diameter less than 2.5 μm), PM₁₀ (particulate nominal diameter less than 10 μm), Total Suspended Particles (TSP), the PM_{2.5} and PM₁₀ percent from TSP, metals and also the water-soluble anions present in the particulate matter in indoor air. The concentration of particulate matter varies widely from a minimum of 11.93 μg/m³ for PM_{2.5} in weekend up to a maximum of 86.75 μg/m³ in a working day with intense activity. The PM_{2.5} average concentration for the period was 42.64 ± 28.28 μg/m³; for PM₁₀ it was determined a period average of 44.09 ± 28.29 μg/m³ and 46.44 ± 30.41 μg/m³ for TSP. The particulate matter are composed mostly of fine particles; so PM₁₀ contains a 96% of PM_{2.5} and total suspended particulates are form from 91% of PM_{2.5}. Analysis by ICP- EOS technique for the acid mineralization of the particulate matter retained on the filters lead to the identification of 15 metals: K, Ca, Fe, Al, Na, Mg, Pb, Zn, Ni, Ba, Cu, Ti, Mn, As, Cr. The metal content in the three dimensional fractions is different, indicating the probability existence of an indoor source for particulate matter with metals. Regarding the content of water-soluble anion in the three dimensional fractions, were identified following ions: NO₃⁻ > SO₄²⁻ > Cl⁻ > F⁻ > PO₄³⁻ > NO₂⁻. Pearson Correlation Analysis indicated a high correlation between all the dimensional particulate fractions and also between metals and anions present in particulate matter. As so, the correlation coefficients for metals have values of R=0.96 for PM_{2.5}/PM₁₀; R=0.93 and R=0.88 for TSP/PM₁₀ for PM_{2.5}/TSP. The high correlations were maybe obtained due to the composition of the PM₁₀ and the TSP, both consisting in PM_{2.5} particulates in percentage of over 90%.

Keywords: indoor air, PM_{2.5}, PM₁₀, metals, anions soluble in water.

IDENTIFICATION OF POWER FACTOR IN MARINE ELECTRICAL GRID**PhD. Grzegorz Nicewicz****MSc. Michał Sosiński****PhD. Dariusz Tarnapowicz**Maritime University of Szczecin, **Poland****ABSTRACT**

The load factor of marine auxiliary engines is one of the basic information for the calculation of air pollutants emission generated by ships. The load factors for different types of ships, determining the results of emission calculations, are provided in various reports with greater or less approximation.

For auxiliary engines, reports of the world's organizations, dealing with air pollutants emissions, present statements of load factors depending on the type of vessel and operating conditions. These statements are prepared on the basis of data collected from registers of ships, log book records and interviews with captains of ships, chief engineers and officers of pilot stations.

Determined in such a manner auxiliary engines load factors are not very precise. This is mainly due to the lack of empirical data on real operating load values of marine electric power systems. The data in the various types of reports sent periodically by chief engineers to ship owning companies technical services, supervising the operation of ships, are too residual. In addition, the load of marine generating sets read from power meters built in Main Switch Board or marine power plant alarm system control panel in Engine Control Room is not equivalent to the load of auxiliary engines. The load of auxiliary engine must be calculated taking into account the engine excess power factor to generator and the efficiency of generator. Unfortunately, in the case of data collected by the ship classification societies, there is no information on the efficiency of generators, the auxiliary engines excess power factors to generators or auxiliary engines continuous power, but only a nominal value of generating sets active power, understood as the active power of generators.

Therefore, the authors developed a method for determining the load factors of marine auxiliary engines in ports in hoteling mode for different types of ships based on identification tests of marine electric power systems load. Description of the method and the results were presented in [1, 2]. The analysis [1, 2] were carried out for constant value of generator efficiency $\eta_G = 0.95$ due to lack of operational data. Unfortunately, the efficiency of generator depends on the load and power factor ($\cos\phi$). The influence of character of marine generating load ($\cos\phi$) on generator efficiency will be analyzed in the paper based on the operational data from modern container ship in all operational conditions.

Keywords: emission of air pollutants by ships, load factor of marine auxiliary engines, generators efficiency

IMPACT OF SMALL HEATING SOURCES ON AIR QUALITY

Assoc. Prof. Dr. Jana Müllerová

University of Zilina, Slovakia

ABSTRACT

Increasing number of small heating sources in households means an increasing number of solid fuel pollutants. Many European households turn from gas to less green - wood combustion. Their impact on overall air quality has increasing trend in Slovakia, although other industries are decreasing the emissions of air pollutants. Small heating sources have around 15% share in air pollution by Particular matters. There are Huge pollutants with much more significant impact on air quality. The greatest one is US Steel which produces more than 50% of all the pollutants in entire country. This fact can be hardly changed. Smaller heating sources can be exchanged much easier. The paper focuses on CO, NO_x, and PM₁₀ matters measured in number of tests. The measurements taken in National Laboratory show the importance of proper wood combustion in wood gasifying boilers in order to maximize its efficiency and decrease the air pollutants emission. There are hundred thousand boilers installed, mostly old ones with high emissions in Slovakia. The most complicated for boiler producers is to decrease the CO emissions to minimum in order to meet actual EN requirements. There are expensive technical solutions or the fuel must be changed to high quality biomass – wood pellets. Classical steel or cast iron hot-water boilers are not able to meet the emission criteria without modification of their construction. Wood gasifying boilers can meet the criteria for CO and PM especially in laboratory conditions.

Keywords: Air pollutant, domestic boilers, emissions, Stationary sources, particular matters.

IMPACT OF TRANSPORT ON AIR QUALITY IN GJILAN TOWN OF KOSOVO– PARTICULATE MATTERS

Assoc. Prof. Dr. Ferat Shala¹

Rizah Hajdari²

Letafete Latifi²

Msc. Halil Demolli¹

Shkumbin Shala²

¹University of Prishtina - Faculty of Mechanical Engineering-Department of traffic, **Kosovo**

²Kosovo Environmental Protection Agency, **Kosovo**

ABSTRACT

Kosovo has an area of 10908 km², with a network of 2,005 km road, and around 211300 vehicles in circulation. Most of these vehicles are older than 10 years, and do not meet the air emission technical requirements. Given the technical conditions of vehicles in use, the conditions of the road infrastructure, and the level of use of vehicles in traffic, the air quality in Kosovo is significantly affected.

This paper presents results of measurements and analysis of the particulate matters (PM) in ambient air in Gjilan town of Kosovo. The actual level of PM in Gjilan town is compared with standards (limit values) of EU Directive 2008/50/EC; and with Kosovo national regulation 02/2011 on limit values and air quality standards. Measurements are made using the automatic GRIMM analyzer. The Analyzer is placed in the proper location, near the main road in order to register the impact of traffic on PM concentration in the air, and to avoid recording the emission from other sources. Measurements included period 01 July 2013 - 31 March 2014, both summer and winter seasons. A comparison between the two seasons was conducted to calculate the impact of other factors in the concentration of PM in ambient air.

From this research is evidenced that the PM annual average value during 2013 achieved 70.9 ug/m³. The transport sector is considered to be the main emitter of primary PM, namely motor vehicles such as cars, trucks, and buses which emit direct PM from their tailpipes, as well as from normal brake and tire wear.

This paper concludes that transport is a very high contributor of the air pollution in Gjilan town, which directly affects human health, since the gases emitted from transport are very close to recipient (humans). Exposure to PM causes a series of significant health problems, including aggravated asthma, chronic bronchitis, decreased lung function, and premature death

Keywords: Particulate matters, transport impact, air quality, monthly average, annual average

**INDICATION OF CLIMATIC CHANGES THROUGH THE INORGANIC
COMPONENTS IN DIATOMS (HOVSGOL)**

Dr. Liudmila Pavlova

Ms. Liliya Tkachenko

Dr. Arcadiy Goreglyad

Acad. Mikhail Kuzmin

Vinogradov Institute of Geochemistry, Siberian Branch, Russian Academy of Sciences, **Russia**

ABSTRACT

Compositions of diatom valves have been for the first time obtained for the intervals of their distribution in two sedimentary sampling depth using the EPMA technique developed earlier. The investigations were performed using electron microscopes Quanta and microprobe JXA8200. The comparison of the inorganic element concentrations suggested some regular features in the change of diatom valve composition throughout the sampling depth. The sampling intervals which contain poorly-preserved valves show higher carbon and lower SiO₂ contents. The comparison with the literary spore-pollen analysis exhibits the correlation between steppe/forest interface and areas with high and low SiO₂ content. Such correlation cannot be random and most likely indicates the prospects of using this procedure. The obtained data can be used as indicators of climatic changes at certain periods of diatoms' life (cold or warm).

Keywords: diatom algae valves, microprobe, climate, Hovsgol, Baikal

INFLUENCE OF METALLURGICAL INDUSTRIES ON ATMOSPHERIC DEPOSITION IN THE AREA OF KOŠICE (SLOVAKIA)

Dr. Jozef Hančulák

MA. Tomáš Kurbel

Dr. Lenka Findoraková

Dr. Tomislav Špaldon

Dr. Oľga Šestinová

Dr. Erika Fedorová

Slovak Academy of Sciences, Institute of Geotechnics, Department of Environment and Hygiene in Mining, Košice, **Slovakia**

ABSTRACT

Total atmospheric deposition i.e. both wet and dry ones, was sampled in the urban and suburban area in the vicinity iron and steel works, the largest industrial source of air pollution in Slovakia. The eleven sampling sites have been placed on the roof above the height of the surrounding buildings at a distance between 1 and 15 kilometres from main source of pollution. Qualitative and quantitative characteristics of the total deposition of solid particles, the deposition fluxes of trace elements (Fe, Al, Mn, Zn, Pb, Cu, Cr, Cd, As), major ions (SO_4^{2-} , NO_3^- , Cl^- , F^- , Ca^{2+} , Mg^{2+} , Na^+ , K^+ , NH_4^+), their seasonal variations and the enrichment factors of these elements were studied. The atmospheric deposition fluxes of trace elements were determined separately for “water soluble” and “insoluble” phase. The obtained results from the years 2009–2013 are pointed out significant influence of the iron and steel works on the studied parameters of atmospheric deposition.

Keywords: atmospheric deposition, trace elements, ions, emission, metallurgy

**LUNGS VITAL CAPACITY OF THE STUDENT'S GROUP-AGE 17-18 YEARS,
IN MITROVICA AND DRAGASH, KOSOVO**

Assoc. Prof. Dr. Kemajl Bislimi,

MSc. Avni Behluli, PhD candidate

MSc. Fahri Osmani,

MSc. Ilir Mazreku,

MSc. Iliriana Demaj,

Assoc. Prof. Hazbije Bojniku

Prof. Dr. Fetah Halili

University of Prishtina "Hasan Prishtina", **Prishtina, Kosovo**

ABSTRACT

This research aimed to evaluate the effect of industrial and traffic pollution in the lungs vital capacity of the students' ages 17-18 years. The implication of gender and body surface area in student's lung vital capacity, were also investigated. In this research were included 360 students of both sexes from the Mitrovica and Dragash urban centers. Mitrovica city considered as a locality with varying degrees of urban and traffic pollution, while Dragash is a locality unaffected by these pollution forms. The research results show that students who attend school in the city of Mitrovica, had a lung vital capacity significantly lower, compared to their peers from Dragash city ($P < 0.01$), despite the fact that students from Mitrovica had higher body surface area (1.83 m^2 for males and 1.58 m^2 for females) compared to the students from Dragash (1.75 m^2 for males and 1.55 m^2 for the females). To measure the lung vital capacity the spirometry method was used the type of Harvard spirometer 9000 ml respectively. While body surface area, was calculated using Dubois formula, from the body weight and body height. Statistical calculations of the results were done by various statistical software's, such as ANOVA and Student t-test.

From the results of this research could be concluded that changes in respiratory parameters, lung vital capacity respectively, are a suitable indicator to assess the impact of pollution on human health.

Keywords: Vital capacity, lung, spirometer, students, pollution

METHODOLOGY FOR EMISSION QUANTITY ASSESSMENT IN LOCAL ROAD TRANSPORT

Dr. Jana Kodymová

VSB- Technical University of Ostrava, Faculty of Mining and Geology, Ostrava- Poruba,
Czech Republic

ABSTRACT

Air protection and emission production is a currently important topic, mainly in terms of greenhouse gas emissions. In the Czech Republic emission analyses of major air pollutants (PM, SO₂, NO_x, CO) have been done since 1994. These emission analyses are executed by the Czech Hydrometeorological Institute, whose founder is the Ministry of the Environment of the Czech Republic. This article briefly introduces emission productions in the Czech Republic. The emissions analyses are structured according to the main pollution groups/categories (large, medium and stationary sources of air pollution and mobile sources of air pollution), including the legislative context. Attention is also paid to the determination of the traffic intensity and the average amount of traffic emissions in a specific part of one road in Ostrava City. In this way emissions are calculated for the dispersion study in the Czech Republic. This type of emission analyses are processed for the same part of the road periodically. This road belongs among those with the most intensive traffic in the centre of Ostrava City (the third largest city in the Czech Republic). Information about traffic intensity is collected by students within a students' project once a year (during October and November). The results are subsequently compared with the national traffic census, done by the Directorate for National Roads and Motorways every 5 years.

Keywords: PM, SO₂, NO_x, CO, emission, traffic, Czech Republic, Ostrava City

**MODELLING OF AIR POLLUTION BY EMISSIONS OF HEAVY METALS
PRODUCED FROM UNCONTROLLED WASTE COMBUSTION IN SMALL
HOUSE BOILERS**

Dr. Mária Koščová, Dr. Viliam Carach,

Assoc. Prof. Dr. Jozef Mačala, Assoc. Prof. Dr. Katarína Kysel'ová,

Dr. Mário Molokáč, Dr. Ladislav Hvizdák,

Dr. Slavomír Drevko, Ing. Juraj Čorba

Technical University of Košice, **Slovakia**

ABSTRACT

At present a waste incineration in households is a great problem. In municipalities with established separate waste collection, the question about waste recovery is partially resolved. In municipalities where separate waste collection is not possible or is not established, citizens use mainly combusted waste as alternative fuel for domestic boilers. Air quality declines especially in winter period of the year. In local house boilers are combusted common fossil fuels (natural gas, lignite, coal, wood, biomass) but also household waste, for example plastic waste, paper, paper and plastic packaging covers, rubber materials etc. Municipal waste contains heavy metals and many hazardous substances as shown in chemical analysis, which are resources of air pollutant emissions. From house stacks, these are emitted to free atmosphere. By chemical analysis of common household wastes we can calculate emission rate for existing pollutants. Using the air quality models, respectively air dispersion models we can calculate local air quality on local level. This article deals with the model calculation of air pollution by emissions of heavy metals (As, Cd, Cr, Cu, Hg, Pb, Sb) produced from uncontrolled waste incineration in small house boilers. By dispersion models we can calculate expected air quality for standard fossil fuels and household waste.

Keywords: air pollution, solid municipal waste, air quality modeling, boilers

NUMERICAL SIMULATION OF PM DISPERSION DURING THERMAL INVERSION

Eng. Irena Pavlikova

Eng. Ondrej Zavila, Ph.D.

M.A. Jan Bitta, Ph.D.

Eng. Marian Bojko, Ph.D.

Ass. Prof. Petr Jancik, Ph.D.

VSB – Technical University of Ostrava, **Czech Republic**

ABSTRACT

The goal was to describe the ground atmospheric layer flow over complex terrain during specific temperature stratification and low wind flow using the Computational Fluid Dynamic (CFD). The numeric simulation was run for the model area of the Horní Lomná valley. The automatic transport of terrain from geographic information system to CFD interface was made, the real boundary weather condition was applied and the flow of particulate matter in the valley from various sorts of pollution sources was studied. The simulation was compared with the Gaussian dispersion model and the pollution measurement data.

Keywords: CFD, fluid dynamic, complex terrain, thermal inversion

OPTIMAZING A METEOROLOGICAL OBSERVING NETWORK BY GEOSTATISTICAL ESTIMATION VARIANCE APROACH

Dessislava Denkova

National Institute of Meteorology and Hydrology, **Bulgaria**

ABSTRACT

Monitoring is fundamental for meteorology .The quality of the data and profitability depends on optimal design of monitoring network. There are different approaches and methods for optimizing the network. Geostatistical estimation variance reduction is one of the unbiased ways of optimizing a meteorological network with a desired accuracy. The existing meteorological network in Bulgaria is consisting of 126 climate monitoring stations. The air temperature data received from them were analyzed geostatistically to reason the spatial variability oh the parameter. The threshold on the maximum standard deviation of the estimation error was defined by comparing with the standard deviation of the data to maintain the order of magnitude. The calculation of the geostatistical estimation error is independent of the measured values so the variance of the estimation error of an uniform grid was calculated to be compared with the threshold. Using this procedure for a given network, is shown an way for its optimizing with a fixed accuracy in the form of maximum permitted variance of the estimation error.

Keywords: monitoring network, optimization, estimation error, air temperature

PARTICLE POLLUTION IN URBAN AND NON-URBAN AREA

Ing. Dušan Jandačka, PhD.¹

Doc. Ing. Daniela Ďurčanská, CSc.¹

¹ University of Zilina, Faculty of Civil Engineering, Department of Highway Engineering, Slovakia

ABSTRACT

Particulate matter (PM) is one of the striking pollutants and causes appreciable degradation of the environment and therefore the quality of life of the population. Formation of particulate matter resulting from vehicular traffic is a problem especially within large cities. Exhaust gases contain large amounts of gaseous and solid pollutants when considering the use of internal combustion engines. These include in particular the presence of large numbers of extremely fine particle fractions, which can remain in the air for a long period of time, easily penetrate and attack the respiratory tract and damage, impact on the health of humans. Particulate matter with a greater aerodynamic diameter originates previously from different parts of cloths road and vehicles. The subject of this presentation is monitoring particulate matter along the cycle of its creation alongside urban roads and non-urban roads and an evaluation of fraction ratios PM₁₀, PM_{2.5} and PM₁ with regard to meteorological conditions and traffic volume.

Keywords: particulate matter /PM/, meteorological conditions, traffic volume, regression analysis

PARTICULATE MATTER PRODUCTION IN TERM OF DIFFERENT TYPES OF WEARING COURSE ASPHALT MIXTURES

Assoc. Prof. Dr. Matus Kovac

Dr. Dusan Jandacka

Assoc. Prof. Dr. Daniela Durcanska

Dr. Lubomir Pepucha

University of Zilina, Faculty of Civil Engineering, **Slovak Republic**

ABSTRACT

Sources of air pollution with reference to particulate matter which originate from the automotive traffic can come either from combustion processes, or non-combustion processes. Non-combustion emissions of particulate matter produced by automotive traffic may come from the tires wear, wear of the braking pads and callipers, lining of brakes, abrasion of road pavement, wear of mechanical clutches, car bodies, and re-suspension of dust collected on the pavement. It is difficult to identify the road pavement abrasion as the direct source of particulate matter in field and separate it from other sources as well as quantify its share on the origination and presence of particulates. One of the possible ways is to approach the chemical analyses of particulate matter as well as multi-layer statistical analyses. But even then it is indispensable to be aware of which chemical substances are to be considered as prime suspects for a given source – to be contained and released by the road pavement surface. The main goal of that experiment was to determine the particulate matter production of various types of asphalt mixtures (various in composition, especially particulate size distribution, maximum grain size, content and type of bitumen binder used). Different asphalt mixtures composition influences particularly the texture of the pavement surface. There was searched the relationship between particulate matter production caused by rolling a wheel across the surface of an asphalt mixture specimen and the pavement surface texture characteristics measured and evaluated by means of 3D scanner with high resolution.

Keywords: air pollution, particulate matter, asphalt mixtures, surface texture, wheel tracking test

**PREDICTION OF METALLURGICAL GASEOUS EMISSIONS SPREADING
OUTSIDE OF THE INDUSTRIAL CENTERS**

D.I. Orelkina

Prof. DSc A.L. Petelin

Prof. DSc Y.S. Yusfin

Ph.D G.S. Podgorodetskii

A.A. Novikov

National University of Science and Technology MISiS, **Russia**

ABSTRACT

The propagation of gaseous emissions of metallurgical industry has been investigated. The main factors responsible for the transportation of gaseous emissions over large distances are identified. A general approach to predicting the spatial distribution of gaseous emissions at large distances from metallurgical enterprises is proposed. The principle of maximum danger was used as a basis for predicting.

Keywords: air pollution, metallurgical gaseous emissions, concentration field, wind rose, chemical kinetics

A QUALITATIVE ANALYSIS OF EXTRAORDINARY METHODS OF CARBON SEQUESTRATION

Prof. Mgr. Juraj Ladomerský, CSc.¹

Dr. Emília Hroncová^{1,2}

¹Matej Bel University in Banská Bystrica, Faculty of Natural Sciences, Department of environmental management, **Slovakia**

²Technical University in Zvolen, Faculty of ecology and environmental sciences, Department of environmental engineering, **Slovakia**

ABSTRACT

Biological waste represents a resource of greenhouse gases. But various ways of treatment with biological waste caused different greenhouse gas production. Considering greenhouse gas production, the energy, material, and substance advantages of waste utilisation can differ noticeably, given the various processes of biological waste handling. Under certain conditions, waste treatment does not necessarily lead to carbon dioxide production in the short-term – when organic mass is applied into the product and in multiple recycling.

The pyrolytic treatment of biological waste, producing pyrolytic coal (coke), and its subsequent deposition into soil represents a hitherto underutilised potential reduction of CO₂ and CH₄ production from an otherwise unutilised organic waste.

In Slovakia, there is significant interest in investments in the production of compost from biologically decomposable municipal waste and sludge from wastewater treatment plants for energy uses. According to our experience, the appropriateness of energy-compost utilisation for specific energy devices has to be verified from the technical standpoint as well as regarding air pollution during the trial operation for appropriateness verification of new fuel.

Through the anaerobic digestion of separated bio waste, or of suitable industrial waste, biogas and digestate are simultaneously obtained as soil fertilizer, usually after composting. CO₂, NO_x, and low concentrations of other substances are the products of biogas combustion.

Environmentally appropriate handling of waste dump gases represents a substantial contribution to the reduction of anthropogenic emissions of greenhouse gases.

Incorporating organic carbon into soil is an inadequate way of reducing greenhouse gas production. A potential for CO₂ sequestration also has some inorganic waste. This paper describes an elementary qualitative analysis of selected procedures of carbon sequestration using wastes.

Keywords: pyrolysis, sequestration, biological waste, red mud, soil

**RECONSTRUCTION OF THE LAKE SHIRA LEVEL CHANGES IN THE
LAST 1500 YEARS USING GEOCHEMICAL INDICATORS.**

Dr. Natalya Maksimova¹

Dr. Andrey Darin¹

Dr. Ivan Kalugin¹

Dr. Tatiana Markovitch¹

Dr. Yakov Rakshun²

Dmitriy Sorokoletov²

Fedor Darin²

¹ Institute of geology and mineralogy SB RAS - **Russia**

² Institute of nuclear physics SB RAS - **Russia**

ABSTRACT

Meromictic Shira Lake is a good representative object for detail climate modeling due to its local hydroclimatic information and annually laminated bottom sediments. For geochemical research was used method of scanning microanalysis with synchrotron radiation. We used a one dimensional scanner and a system for collimating and focusing the beam that allowed us to perform measurements of more than 20 minor elements with detection limits of ~1–5 ppm in cores of bottom sediments with a spatial resolution of 100 µm. The applied experimental apparatus allowed us to reach a new quality of paleoclimatic reconstructions with annual time resolution.

Keywords: Shira Lake, bottom sediments, scanning microanalysis, synchrotron radiation, lake level, reconstruction.

SENSITIVITY EXPERIMENTS WITH REGIONAL CLIMATE MODEL RegCM TO BE USED FOR BULGARIA

Assoc. Prof. Dr. Todor Todorov,

Tihomir Denev,

Assis. Eng. Krastina Malcheva

National Institute of Meteorology and Hydrology (NIMH), **Bulgaria**

ABSTRACT

The regional climate model RegCM, is a community model, constantly improving towards accuracy and flexibility for use. Being at the beginning of its application at the National Institute of Meteorology and Hydrology (NIMH) – Bulgarian Academy of Sciences, the model has to be adjusted for better representation of the results obtained when making a comparison with observations for the territory of Bulgaria. This requires tuning by varying many input parameters, including the possibility for choice of different parameterization schemes.

In this work are presented some results from the sensitivity analyses, carried out with the model version 4.4rc8, and comparison of these results with observations at 11 meteorological stations on the territory of the country for year 1990. The numerical simulations are provided applying sub-grid modeling and horizontal resolution 10 km. Comparison concerns monthly and seasonal mean temperatures and total precipitations.

The comparison shows the best results for precipitations when using the Tiedtke's scheme and for the temperatures - the Emanuel's scheme. There is still additional need to adjust the input parameters for better results concerning the territory of Bulgaria, including the use of different datasets.

Keywords: regional climate model, sub-grid modeling, climate, temperature, precipitation

SHIPPING AIR POLLUTION ASSESMENT. STUDY CASE ON PORT OF CONSTANTA

Associate Professor Dr.Eng. Florin Nicolae¹,

Associate Professor Dr. Cătălin Popa²,

Professor Dr. Eng. Haralambie Beizadea¹,

¹ Faculty of Navigation and Naval Management, Naval Academy Mircea cel Batran, Constanta,
Romania

² Higher Colleges of Technology, ADMC Business Faculty, Abu Dhabi, **United Arab Emirates**

ABSTRACT

International statistics prove that, nowadays, naval transportation represents an important source of air pollution. Black Sea, as closed sea, is defined by a significant and increasing naval traffic. In this framework, noxes emissions from the ships can affect the people health and the environment. Furthermore, sustaining this point of view, the work paper is revealing within an overtaken analysis, the future rate of naval transportation noxes volume, recorded within the period of 2006-2012. In this respect, the authors have made an overall ship operation synthesis focused on pollution agents, within the mentioned period of time, in the studied area of Constanta port. The chosen ship model has been defined based on dedicated statistics as of cargo types, technical operation endowment offered by specialized terminals etc. For the ship model were calculated the major air pollution agents, based on particular computing algorithm. The obtained results may be further used for assessing the impact against the environment in port administration politics, considering some predefined parameters for ships as its tonnage, propelling systems, engine type etc.

Keywords: air pollution, shipping industry.

STUDIES ON CLIMATE VARIABILITY IN THE ARBIL AREA, IRAQ

Assoc. Prof. Dr. Elena Constantin¹

Assoc. Prof. Dr. Kinan Kadir²

Lecturer Dr. Claudiu-Sorin Dragomir¹

Prof. Dr. Florin Mărăcineanu¹

¹ University of Agronomic Science and Veterinary Medicine Bucharest, **Romania**

² Faculty of Agriculture, Arbil, **Iraq**

ABSTRACT

Climate variability manifest on the entire planet poses a real threat to the existence of humankind, resulting in in-depth studies aimed to find mitigation solutions. For this purpose, the findings presented in this article refer to a geographic area where rainfall variability and air temperature were studied by calculating several climate indices (de Martonne, Lang, and de Martonne-Gotman) on ten-year successive intervals, between 1980 and 2008. In the Arbil area, Iraq, there is a decreasing trend in the annual rainfalls and variability recorded each year, particularly over the last decade. Climate indices and the frequency of certain climate phenomena show that the climate evolves towards aridity in this area.

Keywords: climate changes, climate indices, aridity index, geographic latitude, geographic longitude

STUDY ON MATHEMATICAL MODELING OF THE DISPERSION SULFUR DIOXIDE BY BURNING FOSSIL FUELS

Assoc. Prof. Dr. Daniela Cîrțină

Lect. Dr. Irina Pecingină

Prof. Dr. Liviu Cîrțină

”Constantin Brancusi” University of Targu-Jiu, **Romania**

ABSTRACT

The modeling improves the effectiveness of air quality management because in this way can be calculated, predict and estimate the levels of pollutants in the ambient air and can identify the contribution of different categories of sources exceeding the limit. This paper presents a dispersion modeling of sulfur dioxide generated by the emission sources associated activities carried out by the power plants based on fossil fuels, in the Rovinari Energy Complex, Romania. In this study has been analyzed the impact of the operation of these emission sources on air quality, in two distinct activities: activity 1 aims to assess the existing pollution fund, due to other emission sources at regional and local level and activity 2 aims to assess the impact on air quality due solely to the operation of large combustion plants of the Rovinari Energy Complex, considering their performance in five different scenarios, before and after the start of the desulphurisation installation for the four energy blocks. The choice of scenarios was made in order to observe the temporal variation of the SO₂ pollution levels generated by the operation of four energy blocks of the Rovinari Energy Complex, as a result of equipping them with desulphurisation plant of the flue gas from the worst case to ambient air quality corresponding to the first scenario. Dispersion model used TAPM (The Air Pollution Model) is combined model meteorology – dispersing and the modeling results are presented as maps of pollution. The maximum values obtained by modeling of pollutant concentrations analyzed, on different averaging intervals, have been reported for each activity and screenplay by modeling, at the limit values set by legislation on ambient air quality of Romania. From the recorded data shows that impact on air quality due solely to the operation of large combustion plants belonging to Rovinari Energy Complex is extremely high, maximum concentrations from SO₂ obtained by modeling hovering well above the appropriate limit values for four of the five scenarios studied.

Keywords: pollutant, dispersion, mathematical modeling.

STUDY ON POSSIBILITIES OF REDUCING NO_x EMISSIONS AT CTE ROVINARI BY SPLIT INJECTION OF COMBUSTION AIR

Assist Prof. Dr. Adriana Foanene

Eng. Lucica Anghelescu

Assoc. Prof. Dr. Bogdan Diaconu

Prof. Dr. Mihai Cruceru

Assist Prof. Dr. Adina Tătar

University "Constantin Brâncuși" of Tg-Jiu, **Romania**

ABSTRACT

This paper studies the influence of split injection of combustion air on NO_x emissions. Reduction of NO_x emissions is achieved through a series of functional and constructive measures aimed at reducing NO_x in the furnace of the boiler. NO_x formation depends on the amount of nitrogen in the fuel and the amount of combustion air injected into the furnace with fuel. If the nitrogen content in the fuel can not be adjusted, the secondary air introduced into the furnace can be modulated.

Secondary combustion air introduced into the furnace with fuel can be reduced to the extent that it further provides stable ignition and combustion of the fuel. Reduction of the amount of air introduced through the burners causes a shortage of air into the burner, leading to an increase in the content of carbon monoxide (CO) and mechanical un burn in the flue gas. This effect is compensated by placing the top of the combustion air (tertiary air) in one or more areas located between the outlets of the furnace burner output. It realizes the so-called fractional combustion air. Tertiary air to be introduced in order to ensure the best possible mixing of the combustion gases with secondary air, the excess air necessary to ensure that the output of the furnace to ensure complete combustion and prevent slagging. The excess air is small; the quantity of formed nitrogen oxide is low.

Thus the paper examines several options for introducing secondary air establishing the optimal solution.

Keywords: emission, combustion air, pollution, split injection, nitrogen oxide.

TEMPERATURE INDICES OF CLIMATE CHANGE IN GEORGIA

**Assoc. Prof. Dr. Mariam Elizbarashvili¹, Phd student Davit Mikava²,
Phd student Bagrat Kikvadze², Phd student Nano Gogia¹,
Phd student Ina Keggenhoff³, Dr. Nato Kutaladze⁴, Mate Managadze²**

¹ Ivane Javakhishvili Tbilisi State University, **Georgia**;

² Ilia State University, Tbilisi, **Georgia**;

³ Justus-Liebig-University Giessen, **Germany**;

⁴ The National Environmental Agency, **Georgia**

ABSTRACT

Based on the observation data of meteorological stations in Georgia, spanning the period from 1936 to 2011 several Temperature Indices of Climate Change have been researched. These indices are among 27 core climate change indices developed by the World Meteorological Organization and Expert Team on Climate Change Detection, Monitoring and Indices (ETCCDMI) of the intergovernmental commission on climate change.

Geoinformational maps of spatial structure have been built and the dynamic of the indices over the period of global warming have been studied. Average values of several Temperature indices of Climate Change for various averaging times have been determined.

Keywords: Temperature Indices, Climate Change modeling

**THE AGE MODEL SEDIMENTATION IN LAKE SHIRA (KHAKASIA,
RUSSIA) USING VARVES COUNTING AND RADIOCARBON
DETERMINATIONS**

Dr. Andrey Darin¹

Dr. Ivan Kalugin¹

Dr. Natalya Maksimova¹

Dr. Tatiana Markovitch¹

Dr. Yakov Rakshun²

Dr. Denis Rogozin³

Dmitriy Sorokoletov²

Fedor Darin²

¹ Institute of geology and mineralogy SB RAS - **Russia**

² Institute of nuclear physics SB RAS - **Russia**

³ Institute of biophysics SB RAS - **Russia**

ABSTRACT

Meromictic Shira Lake is situated in the semi-arid climatic area of South Siberia. The lake has a size of 5 × 9 km and a maximum depth of 24 m. A sediment column of 155 cm in length was retrieved in the deepest part of the lake. The sediment has thin laminated structure, where black clay carbonate organic-bearing layers are coupled with white organic free ones. Thickness of coupled rhythms varied from 2 mm in the uppermost 20 cm of core to 0.4 mm close to the bottom. For calculation of the layers were used pictures of wet core, optical thin sections and geochemical indicators, marking each annual layer. For dating the depth of the core were used AMS data ¹⁴C content, the activity of ¹³⁷Cs and ²¹⁰Pb. Comparison of age model, obtained by counting annual layers with radiocarbon data, showed that the «reservoir effect» in Lake Shira is equal 1275 years. Radiocarbon data reduction by this amount gives a good coincidence all results.

Keywords: Shira Lake, bottom sediments, annually laminated layers, varves, scanning microanalysis, synchrotron radiation.

THE ASSESSMENT OF THE AIR QUALITY IN THE REVITALIZED LOCALITY OF THE MOST LAKE

Ing. Milena Vágnerová

Ing. Jan Brejcha

Ing. Lenka Vaidišová

Výzkumný ústav pro hnědé uhlí a.s., **Czech Republic**

ABSTRACT

The opencast mines in the region of the North-Bohemian basin are and will be in the close future step wisely closed. The planned and realized reclamation procedure in the foot of the Krušné hory (the Ore Mountains) is based on the constitution of the artificial lakes dedicated mainly to the recreation purposes. The hydrological reclamation represents considerable impact into the landscape, which will influences changes of microclimate, ecosystem and fresh-air quality. The evaluation of the fresh air quality in the remediated area of the Lake Most is one part of the complex project No. TA01020592 “Impacts of a hydrological open-cast mine reclamation on the microclimate, fresh-air quality, water and soil ecosystems” solved in the frame of the ALFA programme of the Technological Agency of the Czech Republic. The research is focused in the field of air quality on the assessment of the relevance of changes in air quality in the vicinity of the Lake, which occur as a result of changes of the microclimate in the area. The project monitors the long-term deposition of pollutants, which are characteristic for this industrial site -SO₂, NO_x, O₃, VOC, BTX, dust fallout and selected metals in dust fallout. The air sampling is carried out by passive technic. In addition to the listed pollutants, the concentration of aerosol particles PM₁₀ is continuously measured in the second zone and on the background reference site.

Keywords: hydrologic reclamation, Lake Most, fresh-air quality, dust fallout, PM₁₀

THE CLIMATIC CONDITIONS DURING SUMMER IN BULGARIA AND THEIR INFLUENCE ON COOLING DEGREE DAYS

Cvetan Dimitrov PhD

Assoc. Prof. Dr. Anelia Gocheva

Dessislava Denkova

Assis. Eng. Krastina Malcheva

National Institute of Meteorology and Hydrology, **Bulgaria**

ABSTRACT

Nowadays, the study of the discomfort period during the warm half-year became especially relevant for construction and healthcare. The discomfort periods become more and more prolonged, resulting in an increased use of air conditioners for maintaining of comfortable and healthy microclimate. It can be expected that in the next decade the energy consumption during the summer will be progressively escalating. Since Bulgaria is deficient in own energy resources, the optimal use of all available sources of energy taking into precisely account the climatic conditions is essential for optimization of design and maintenance of buildings.

The aim of this study is to analyze the influence of climatic conditions and their variations on the energy efficiency of buildings by means of an integrated characteristic – cooling degree days (*CDD*). The three largest and densely populated Bulgarian cities – Sofia, Plovdiv and Varna are explored, because of the large number of inhabitants and the significant energy consumption. The impact of contemporary climate conditions on the character of the summers in Bulgaria has been assessed using air temperature data, integrated characteristic of the discomfort period – cooling degree days (*CDD*) and other complex climatic parameters. Analysis of the seasonal course, interannual variability and trend in respect of air temperature, cooling degree days and some complex climatic parameters is made. The results for the last decade are compared with the normals for 30-year period (1981 – 2010). A comment for the character of the summer's discomfort period, its interconnection with climatic conditions and their variability for the cities, situated at different climate regions on the territory of the country, is presented.

Keywords: Applied Climatology, Climate Variations, Cooling Degree Days, Climatic Indices.

THE CONCEPT OF WIRELESS SENSOR NETWORK FOR EARLY WARNING IN THE CASE OF ACCIDENTAL RELEASES

M. Sc. Jan Suchanek^{1, 2}

Prof. Zdenek Zelinger¹

Dr. Vaclav Nevrlý^{2, 3}

Dr. Petr Bitala^{2, 3}

Dr. Martin Ferus¹

M. Sc. Michal Dostal^{1, 2}

M. Sc. Jakub Dlabka²

¹ J. Heyrovský Institute of Physical Chemistry, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

² VSB-Technical University of Ostrava, Faculty of Safety Engineering, **Czech Republic**

³ Institute of Thermomechanics, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

ABSTRACT

Recent development of promising instrumentation based on spectroscopic sensor technology and the concept of methodology for data handling and interpretation is presented by this work. Conventional experimental setup for tunable diode laser spectroscopy employing vertical cavity surface emitting laser (VCSEL) operating near 1300 nm was utilized for measurements in laboratory conditions. Characteristic spectral features of ammonia, hydrogen fluoride and methane were found in the tuning range of available VCSEL diode, implying feasibility of the given technique for construction of sensor nodes. Implementation of such units into the wireless sensor networks and early warning systems for risk areas and industrial sites is therefore presumed. This work summarizes some aspects concerning NIR-TDLAS measurement technique, sensor node construction and presents innovative concept of designing the sensor network, data handling and interpretation.

Keywords: gas detection, sensor network, laser diodes, dangerous chemicals, accident

THE CONCEPT OF WIRELESS SENSOR NETWORK FOR EARLY WARNING IN THE CASE OF ACCIDENTAL RELEASES

M. Sc. Jan Suchanek^{1, 2}

Prof. Zdenek Zelinger¹

Dr. Vaclav Nevrlý^{2, 3}

Dr. Petr Bitala^{2, 3}

Dr. Martin Ferus¹

M. Sc. Michal Dostal^{1, 2}

M. Sc. Jakub Dlabka²

¹ J. Heyrovský Institute of Physical Chemistry, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

² VSB-Technical University of Ostrava, Faculty of Safety Engineering, **Czech Republic**

³ Institute of Thermomechanics, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

ABSTRACT

Recent development of promising instrumentation based on spectroscopic sensor technology and the concept of methodology for data handling and interpretation is presented by this work. Conventional experimental setup for tunable diode laser spectroscopy employing vertical cavity surface emitting laser (VCSEL) operating near 1300 nm was utilized for measurements in laboratory conditions. Characteristic spectral features of ammonia, hydrogen fluoride and methane were found in the tuning range of available VCSEL diode, implying feasibility of the given technique for construction of sensor nodes. Implementation of such units into the wireless sensor networks and early warning systems for risk areas and industrial sites is therefore presumed. This work summarizes some aspects concerning NIR-TDLAS measurement technique, sensor node construction and presents innovative concept of designing the sensor network, data handling and interpretation.

Keywords: gas detection, sensor network, laser diodes, dangerous chemicals, accident

THE INFLUENCE OF MINING ACTIVITIES IN THE AIR QUALITY AND STRATEGIES FOR ITS IMPROVEMENT: THE TAIYUAN (CHINA) CASE STUDY

Zhou Qinglong^{1,2}; Herbert, Juan Herrera²; Gomez, Jorge Castilla²

¹ Institute of Mining Technology, Taiyuan University of Technology, **China**.

² Department of Mining and Underground Excavations. Madrid School of Mines. Technical University of Madrid (UPM), Madrid, **Spain**.

ABSTRACT

In 1998, a list of the ten most polluted cities was released by the World Health Organization (WHO). Taiyuan, one of the Chinese industrial, energetic and chemical industry hubs, ranks foremost among these cities. In January 2012, the Asian Development Bank (ADB), the World Resources Institute (WRI) and the Tsinghua University (THU) jointly issued the “Toward an Environmentally Sustainable Future - Country Environmental Analysis of the People’s Republic of China (PRC)”, which showed that less than 1% of the 500 largest cities in the PRC meet the air quality standards recommended by the WHO, and 7 cities in the PRC are ranked among the 10 most polluted cities in the world. Once again, Taiyuan in the Shanxi Province was ranked first.

Based on the case of the industrial city of Taiyuan in Shanxi province, this paper shows how this problem is studied and the methodology developed to bring solutions to improve the reduction in air pollution maintaining the city as one of the most economic and industrial centers in China. For this, the paper firstly makes a detailed description of its air contamination in recent years and then analyses those polluting factors, including the old and irrational industrial layout, special geographical location, meteorological condition of Taiyuan and the intensive mining operations of surrounding areas. With these combined effects of various factors, the paper discusses how to effectively improve its pollution situation.

Keyword: Air quality, Industrial city, Taiyuan, Environment, Mining activities.

THE INFLUENCE OF THE ASPHALT MIXTURE COMPOSITION ON THE PAVEMENT SURFACE TEXTURE AND NOISE EMISSIONS PRODUCTION

Assoc. Prof. Dr. Eva Remisova

Prof. Dr. Martin Decky

Assoc. Prof. Dr. Matus Kovac

University of Zilina, Faculty of Civil Engineering, **Slovak Republic**

ABSTRACT

The article deals with properties of three different the most common used asphalt mixtures, for pavement wearing course in term of noise pollution. The noise emissions production is influenced (except for the tires, type and speed of vehicle) particularly by pavement surface texture. The texture depends on asphalt mixture composition, especially aggregate particle size distribution, maximum nominal aggregate size and content and type of bitumen binder.

The article presents results of research activities of authors dealing with three different asphalt mixtures – stone mastic asphalt (SMA), asphalt concrete (AC) and porous asphalt (PA). The texture characteristics of the listed asphalt mixtures were measured and evaluated by means of 3D scanner with high resolution. There were also evaluated physico mechanical characteristics of the asphalt mixtures, and noise pollutions measurements on selected road sections were performed as well.

Keywords: asphalt mixtures, asphalt pavement, surface texture, noise emissions, 3D scanner

**THE INFLUENCE OF THE LOCAL CLIMATE CHANGES ON THE AIR
QUALITY IN THE AREA OF THE HYDRIC RECLAMATION - THE LAKE
MOST**

Ing. Jan Brejcha

Ing. Milena Vágnerová

Výzkumný ústav pro hnědé uhlí a.s., **Czech Republic**

ABSTRACT

Brown coal open pit mines in the North Bohemia region are slowly approaching their boarders and they are going step by step to the end of their operation. Planned and even already realized reclamation procedure in the region is based on the formation of artificial lakes. The nature of the surface cover in the studied area has changed from mining landscapes without vegetation to the water area with “green” surroundings after the hydrological reclamation of the residual pit of the quarry Most – Ležáky. The local climate is significantly influenced within the warm part of the year, when the temperature of the water in the Lake is higher than the air temperature. The period of daily temporarily degraded local dispersion conditions is extended under certain meteorological conditions and thus the time for the possible dilution of cumulated pollutants is shorter. The evaluation of the fresh air pollution development in the foothills of the “Krušné hory” Mountain during the gradual filling of the Lake in the years 2008 to 2013 proved an anomalous increase in the number of the day with the exceeded limit of the 24-hour average of the PM₁₀ concentration of aerosol particles on the stations in the vicinity of Lake Most in the comparison with the other stations in the region. This situation was typical for the spring and summer months of the years 2010 to 2013. The similar phenomenon was not detected within the years 2008 and 2009, when only a small part of the Lake was filled. The subject of the current research is the classification of the real dispersion conditions in the context with the meteorological situation in the area and the selection of such situations in which a significant influence on the local air pollution can be expected thanks to the microclimate change. The model evaluation will be done for such selected situations to evaluate their spatial extent and the significance of this influence.

Keywords: hydric reclamation, Most Lake, air quality PM₁₀, local climatic effect

WARM MIX ASPHALT – ENVIRONMENT FRIENDLY PAVEMENT TECHNOLOGIES

Lecturer Dr. Eng. Adrian Burlacu¹

Assoc. Prof. Dr. Eng. Carmen Răcănel¹

¹ Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

The destruction of natural resources and climate change are the main causes of damage and disruption of ecosystems. Industry, agriculture, and transport are blamed for being the main contributors. This awareness was formalized in 1997 by the Kyoto Protocol to the United Nations Framework Convention on Climate Change which featured, in particular, a commitment made by signatory states to bring greenhouse gas emission rates down to 1990 levels. This agreement came into force on February 13, 2005. Warm-mix asphalt technology addresses this issue in a rather small but important way. The concept of warm-mix asphalt has been introduced over the last few years, a mixture produced at temperatures in the range of 20°C to 40° C lower than typical hot-mix asphalt (HMA). Technologies that allow lower HMA production temperatures may demonstrate positive impacts on pavement performance and in reduction of pollutant emissions. The results are presented like comparative graphs and the conclusions will establish which is the performance of WMA.

Keywords: roads infrastructure, warm mix asphalt, CO2 reduction, bitumen additives, mixture stiffness

ZONING OF THE TERRITORY OF IRKUTSK (RUSSIA) BASED ON INTEGRATED ASSESSMENT OF AIR POLLUTION

Assoc. Prof. Dr. Saiana Vologzhina
Assoc. Prof. Dr. Ekaterina Sutyryna
PhD student Anastasiia Akhtimankina

Irkutsk State University, **Russia**

ABSTRACT

The article is devoted to the study of pollutant distribution in the atmosphere of Irkutsk. These pollutants enter the air basin from industrial enterprises and vehicles. Irkutsk is a big industrial centre of Siberian federal district of Russian Federation. On the grounds of the city there are approximately 250 industrial enterprises with more than 3 000 stationary air pollution sources carried as an asset and more than 200 000 vehicles.

Air pollution was estimated by the multivariate statistical analysis and the numerically simulated model based on analytic calculations of differential equation of travel and eddy mixing extraneous substances. Inventory data for indicators of emitters, vehicle data and remote sensing data together with long-standing data of wind velocity and air temperature daily weather observations with 8-prefix of time were applied as the input information. Special attention has been paid to climatic features of the area, as the city is located in an area with low self-purification potential of the atmosphere.

By results of research the authors carried out zoning of the city, identified the areas with the highest level of pollution based on distribution of emissions from stationary and mobile sources and analysis of the accumulation of pollutants in the snow cover.

Keywords: remote sensing, modeling, industry, vehicle, snow cover

**ABOUT CORRELATION ANALYSIS OF CHEMICAL COMPOUND OF
ATMOSPHERIC PRECIPITATION IN THE NORTH OF THE RUSSIAN
PLAIN**

Dinara Khayrullina

Department of Landscape Ecology, Institute of Ecology and Geography/Kazan Federal University, **Russia**

ABSTRACT

The paper deals with estimation of spatial and temporal variability of magnitude and number of statistically significant coefficients of correlation between components of chemical compound of atmospheric precipitation in the North of the Russian plain. There is direct relationship between magnitude of correlation coefficients and chemical composition of atmospheric precipitation. For example, in space aspect the greatest number of significant correlation coefficients meets on coastal and city continental weather stations. Finally, in temporal (seasonal) aspect this regularity is observed in May, i.e. ion concentration increases in the air during the season of photochemical activity.

Keywords: atmospheric precipitation, aerosols, condensation nuclei, chloride ions, correlation analysis, statistically significant correlation coefficient, weather station

AN EXPLORATORY ANALYSIS OF PM₁₀ PARTICULATE MATTER RELATIONSHIPS WITH WEATHER DATA AND SPATIAL VARIATION

Assoc. Prof. Dr. Daniel Dunea

Valahia University of Targoviste, **Romania**

ABSTRACT

The main aim of the paper was to explore the interrelationships between PM₁₀ time series and various weather parameters i.e. air temperature, atmospheric pressure, relative humidity, solar radiation, and wind speed, recorded hourly at six automated monitoring stations located in Oltenia South-West region of Romania. Significant correlations ($p < 0.001$) were observed between PM₁₀ concentrations and air temperature, PM₁₀ and atmospheric pressure, and PM₁₀ and wind speed at all stations. These associations were not dependent on monitoring location, and provided reliable PM₁₀ concentrations tendencies according to weather parameter's change. PM₁₀ concentrations increased with temperature abatement, increased with atmospheric pressure rising, and decreased with wind speed enhancement. A case study performed in Targoviste city is presented to supplement the knowledge on PM₁₀ spatial variation. Resulted thematic maps with isolines showed high levels of PM₁₀ particles in the western and northwest parts of the city, which are correlated with intense heavy traffic and neighboring active industries from northwest. Geo-referenced PM₁₀ quantitative knowledge facilitates the selection of control strategies for reducing exposure risks for the inner-city residents.

Keywords: particulate matter, weather data, correlation, concentration isolines

ANALYSIS OF NO_x AIR QUALITY INDICATORS IN URBAN AREAS OF CLUJ COUNTY, ROMANIA

Assoc. Prof. Dr. Adina-Eliza Croitoru¹

Lecturer Dr. Răzvan Horațiu Băținaș¹

Dipl. Eng. Dr. Liana Mureșan²

¹ Babeș-Bolyai University, Faculty of Geography, **Romania**

² Cluj Environmental Protection Agency, **Romania**

ABSTRACT

The urban air quality is one of the most important issues has attracted the attention of many researchers worldwide because it's strong impact on human health. The present study is focusing on some important air quality indicators, in Cluj County, Romania: nitrogen oxides (NO, NO₂, NO_x). The data have been collected in five measurement points located in two different cities in Cluj County: four points in Cluj- Napoca and one in Dej. Cluj-Napoca is one of the most important city of Romania, with more than 320,000 inhabitants, while Dej was one of the most industrialized city of Cluj County, which has about 33,000 inhabitants. The recordings were extended over a period of 5 years (2009 – 2013), with daily data coverage. The data were obtained by using the chemiluminescence technique for all five points. The main results are: the highest concentrations have been recorded during the cold half of the year (October - March) when exceeding of the maximum allowed values may occur, associated to specific weather condition (low thermal inversions) and heating systems; the most polluted spots were identified in Cluj-Napoca city, in the industrial and high traffic areas.

Keywords: NO_x, air quality, Cluj, Romania

APPLICATIONS OF LIFE CYCLE ASSESSMENT (LCA) IN SHIPPING INDUSTRY

Associate Professor Dr.Eng. Florin Nicolae¹,

Associate Professor Dr. Cătălin Popa²,

Professor Dr. Eng. Haralambie Beizadea¹,

¹ Faculty of Navigation and Naval Management, Naval Academy Mircea cel Batran, Constanta,
Romania

² Higher Colleges of Technology, ADMC Business Faculty, Abu Dhabi, **United Arab Emirates**

ABSTRACT

The paperwork is approaching different aspects related to the environment dimensions within the life cycle assessment of a ship. This scientific endeavors take under consideration environment issues related to the commercial ships, seen as a complex systems, integrated in economic and technical cycles, in line with shipbuilding and repairing shipyards, naval transports (maritime and riverine), port activities and its correlative activities. Thus, ships life cycle has been decomposed in successive or overlapping stages, as designing, building, exploiting and scrapping phases. For our LCA purposes was used Solid works software was chosen a ship model and a route, defined as work hypothesis. The proposed solutions are to lead to the impact decreasing against the environment, by optimization raw materials and energy consumption and by recycling processes incentive as to the end of operating processes.

Keywords: LCA (Life Cycle Assessment), shipping industry, sustainable development

**ASSESSMENT OF THERMAL COMFORT INSIDE VEHICLES – AN
EXPERIMENTAL EVALUATION**

Lecturer Dr. Croitoru Cristiana¹

Lecturer Dr. Vartires Andreea¹

PhD student Dogeanu Angel¹

Lecturer Dr. Bode Florin²

Assoc. Prof. Dr. Nastase Ilinca¹

Dr. Iatan Alexandru¹

¹CAMBI Research Centre, Technical University of Civil Engineering Bucharest, **Romania**;

²Technical University of Cluj-Napoca, **Romania**

ABSTRACT

Vehicular fuel consumption and its environmental impact can be reduced significantly with advanced climate control systems that intelligently deliver conditioned air, and use more efficient diffusion. However, there is a continuing need developing thermal comfort models and evaluation methods for these systems. The objective of this study was to investigate the thermal comfort inside the vehicle, analyzing the airflow around thermal manikins and evaluating thermal comfort indices. Two thermal manikins were used to evaluate thermal comfort inside a vehicle. We simulate two passengers and their interaction with the environment. The temperature of the manikins is controlled, generating a thermal plume similar of the passengers inside the cabin. Velocity and temperature measurements help evaluating the indoor air quality and airflow, allowing to evaluate the thermal comfort index: PMV. Comparison with personal thermal comfort assessment was completed. The results permit the evaluation of indoor thermal comfort and the discrepancy in application of standard thermal comfort indices, unadapted to transient conditions as found in the vehicles.

Keywords: thermal manikin, thermal comfort in vehicle, cabin airflow, PMV index

CHANGES IN HOT EXTREME TEMPERATURE INDICES IN CARPATHIAN AND INTRA-CARPATHIAN AREAS OF ROMANIA

Assoc. Prof. Dr. Adina-Eliza Croitoru¹

Dr. Adrian Piticar¹

¹Babeş-Bolyai University, Faculty of Geography, **Romania**

ABSTRACT

Changes in daily extremes events is one of the most important topic in climate literature and many studies have been conducted so far at local or regional scale worldwide. For the Romanian territory, only little research on this issue was done. In this article, the Carpathian and intra-Carpathians regions of Romania were considered. This study is focused on analyzing the trends of daily extreme temperature indices at a regional scale over a period of 50 years: 1961–2010. Data sets of daily minimum and maximum temperature recorded in 10 weather stations were analyzed. The main goal was to find changes in daily extreme temperatures by using a set of 9 indices adopted from the core indices developed by ETCCDMI with appropriate modifications to suit to the analyzed territory. The main results suggest that the climate has become warmer during the last decades. Trends of extreme temperature indices at the regional scale of Carpathians and intra-Carpathians areas are increasing for most of the indices calculated. It has been identified that both extreme daily maximum and minimum temperatures indices have increased in the analyzed areas. For all the indices related to hot temperature most trends are statistically significant.

Keywords: daily extreme temperature indices; daily maximum and minimum temperatures; trend; Mann-Kendall test and Sen's slope; Carpathian and intra-Carpathian areas of Romania

**CLEAN TECHNOLOGIES DEVELOPMENT STRATEGY
FOR THE NATIONAL BLACK CARBON CONTROLLING SYSTEM
IN THE RUSSIAN ARCTIC**

Assoc. Prof. DSc. Valery M. Abramov

Assoc. Prof. DSc. George G. Gogoberidze

Prof. DSc. Lev N. Karlin

MSc. Julia A. Lednova

MSc. Nikolaj N. Popov

Russian State Hydrometeorological University, Arctic and Subarctic Institute, **Russia**

ABSTRACT

We draw the strategy for development of basic clean technologies that have to be used within national black carbon management system in the Russian Arctic. Black carbon is the significant short-lived climate forcer and it has to be under global control. The main black carbon sources (transport, energy, industry, biomass burning, wildfires) are outside the Arctic. Migration of black carbon to the Arctic from the emission areas is due to the general atmospheric circulation. Therefore, the management system of black carbon content in the Arctic must be global. Today such a system is missing. In the current geopolitical conditions, such a system should consist of national systems for national responsibility areas of the Arctic countries (Russia, Canada, USA, Denmark and Norway). These national systems should be aimed at the control of emissions of black carbon, on the operational measurements of its concentration in the atmosphere, the definition of patterns and scenarios of its penetration into the Arctic, and also on decision making support in the field of regulation at the national level. Another task is the coordination of national systems for ensuring the effective functioning of the global control system for black carbon in whole. Development and introduction in practice of these basic technologies will have a stimulating effect on the market of environmental goods and services. The Ministry of education and science of Russia provided financial support for this research with the state order 2014/166 and state contract 14.515.11.0002.

Keywords: climate change and variability, air management, particulate matter, black carbon, decision support systems

**CLIMATE RECONSTRUCTION TECHNIQUE BASED ON GEOCHEMICAL
TIME SERIES OBTAINED FROM BOTTOM SEDIMENTS (TELETSKOE
LAKE, SOUTH SIBERIA) FOR THE LAST 1500 YEARS**

Assoc. Prof. Dr. Ivan Kalugin

Dr. Andrey Darin

Dr. Valeriy Babich

V.S. Sobolev Institute of Geology and Mineralogy SB RAS, **Russia**

ABSTRACT

The bottom sediments were studied as a source material for the mathematical treatment. 10 geochemical parameters: Ca, Ti, Mn, Fe, Br, Br / Rb, Br / Sr, Br / Y, Co / Inc, Sr / Rb were considered. The elements content were measured by X-ray fluorescence analysis on synchrotron radiation (SR XRF, BINP) along the entire length of the sediment core (1974 mm) with 1mm step. Matrix of the geochemical time series was built taking into account continuous sedimentation at an average accumulation rate of 1.06 mm/year in the time interval AD 530-2010 years. Reconstruction of target parameters (temperature, precipitation and "climate type", lake level) made by three methods - regression, discrimination and nearest neighbor realizing different approaches to the problem to be solved.

Keywords: Geochemical time series, paleoclimate, reconstruction, mathematical treatment

COMPARISON OF MODELED AND OBSERVED RESULTS FOR TEMPERATURES AND PRECIPITATIONS OVER BULGARIA

Assoc. Prof. Dr. Todor Todorov,

Assis. Eng. Krastina Malcheva,

Tihomir Denev

National Institute of Meteorology and Hydrology (NIMH), **Bulgaria**

ABSTRACT

The use of climate models, global or regional, is a modern approach to diagnose and predict the different weather and climate variables. Models become more and more comprehensive in the parameterization of the physical processes in the atmosphere and accurate in computation of wind, temperature, precipitation, radiation and other fields and flows.

The regional climate model RegCM, version 4.4rc8, is used in this work to calculate the mean monthly temperatures, monthly maximum and minimum extreme temperatures as well as monthly total precipitations for years 2000 and 2005. They are compared with the observations at 19 stations, situated in different climate regions over Bulgaria. For this purpose the model (in a sub-grid mode with horizontal grid step 10 km) is used after some adjustments towards input parameters used, mainly in the choice of different cumulus convection parameterization schemes, in order to obtain better results for representations. The comparison shows that the model needs of further adjustment in order to improve the results. This requires sensitivity experiments, including global dataset change. The model uses the initial and boundary condition from the global climate models, in this case the re-analyses from E15 dataset. Some of the results are presented in figures using the visualization package GrADS.

Keywords: regional climate model, sub-grid modeling, climate, comparison, temperature, precipitation, extreme

CORRELATION ANALYSIS OF REFRIGERATION SYSTEMS FAILURES IN POLISH FISHING VESSELS

Prof. PhD. Katarzyna Gawdzińska

MSc Waldemar Kostrzewa

PhD. Grzegorz Nicewicz

Maritime University of Szczecin, **Poland**

ABSTRACT

Refrigeration systems of fishing vessels have a similar impact on the natural environment as refrigeration devices applied in remaining economy sectors. Adopting a principle of estimating equipment costs in the entire operation period, it must be stated that environment impact appears in all installation lifetime stages, from its elements production moment, through assembly, startup, operation, repairs, shutdown and liquidation. Fundamental elements of the environmental impact are impoverishing ozone layer in the ionosphere, gas emission, smog production in the lowest atmospheric layers, soil and waters acidity change as well as natural water reservoirs eutrophication.

As a result of international actions the refrigeration industry tries to limit its harmful impact on natural environment by introduction of new refrigerant and design solutions of refrigeration installations. An integrated approach to the issue includes:

- installation design choice and refrigerant selection;
- procedures choice, responsible for safe refrigerant operation;
- introduction of technology reducing leaks and increasing installation efficiency;
- promotion of the latest knowledge and staff training, responsible for designing and operation;
- predicting and estimating possible refrigeration systems elements failures for prevention and repair purposes.

These issues remain in the interest of centers responsible for implementation of environment-friendly solutions in the refrigeration.

The paper presents the correlation analysis of failures occurred in the refrigeration systems of Polish fishing vessels in 2007-2011 years. Analysis results described in the paper can be a base to draw up guidelines, both for designers as well as operators of the marine refrigeration systems to avoid the harmful impact on ozone layer and natural environment.

Keywords: failures, fishing vessels, refrigeration systems, harmful impact on ozone layer

**DETERMINATION OF CRITERIA WEIGHTS VALUES FOR WIRELESS
SENSOR NETWORK ORIENTED ON MONITORING OF AIR POLLUTANTS
RELATED TO TRAFFIC**

Vendula Hejlová

Palacký University in Olomouc, **Czech Republic**

ABSTRACT

Air pollution is a serious problem all around the world. The highest contribution to rising emissions in the air is caused by burning of fossil fuels and transportation. Road traffic is a big problem in cities and developing countries where the number of cars is increasing. The major pollutants which are related to transportation are NO_x, CO_x and VOC. It is necessary to monitor the values of these pollutants because they have to be held below their highest allowed limits. Wireless sensor network seems to be a good technology for measuring values of air pollutants in cities. Every wireless sensor network consists of (wireless) nodes equipped with needed sensors, gateway and server. The biggest advantage of this technology is that data are collected in a real time so that the most endangered areas can be warned in time. Nodes can be distributed in the area of interest with high density so that detailed information about air pollutants is obtained. Data obtained by sensors, recorded in nodes are sent to a gateway and resent to a server for a long time storage.

This study focuses on usage of wireless sensor networks for monitoring of air pollutants related to traffic. Criteria for the selection of nodes with integrated demands on needed sensors were determined and evaluated by their importance. The optimal parameters for application of this kind of wireless sensor network were specified. Weight values of the selected criteria were established on the basis of four methods. The computed values of weight for determined criteria were compared and visualized. The most appropriate method for this kind of task was chosen. Determination of criteria and their weight values is a basis for selection of the most suitable nodes, sensors for determined task.

Keywords: Wireless Sensor Network, Criteria, Air Pollutants, Weight Determination

EVALUATION OF NATIONAL EMISSIONS FROM THE INDIVIDUAL HEATED DWELLINGS

Assoc. Prof. Dr. Irina Meghea¹

Dr. Adriana Bors²

Chem. Carmen Munteanu²

¹ POLITEHNICA University of Bucharest, Faculty of Applied Sciences, Department of Mathematical Models and Methods, **Romania**

² National Research & Development Institute for Environment Protection, Bucharest, **Romania**

ABSTRACT

The individual heating facilities in residential and non-residential areas are emission sources that give important weight to the national emission of fine particulates. Modernization and thermal rehabilitation of dwellings has as main goals the improvement of thermal isolation performances of building elements which delimit from exterior the internal heated spaces, as well as the increase in energy efficiency of thermal plants aferent to dwellings. The aim of rehabilitation of heating supply systems for warm water and food preparation for dwellings and social cultural buildings is to assure the energy consumption by diminishing energy and thermal agent losses, reduction of pollutant emissions, import decreasing of energetic materials, increasing thermal confort conditions.

The paper contains a description of peculiarities in the evaluation of atmospheric pollutants from dwellings located in different zones of the country. The results of research for finding out a computational method to evaluate emissions of atmospheric pollutants using „bottom-up” procedure are presented. The computational method developed represents a useful tool for the extension of the investigation to the prediction of emission values so as to make possible the elaboration of an action plan and to establish technical solutions that are to contribute to a sound living level on medium and long terms.

Keywords: individual heating, atmospheric pollutants, dwellings insulation, fossil fuels, heat transfer

EVALUATION OF THE REGIONAL AIR QUALITY EFFECTS OF ISTANBUL CEBECİ QUARRY AND CRUSHING-SIFTING FACILITIES IN TERMS OF PM₁₀ AND SO₂ CONCENTRATIONS

Edip Avşar¹

Ertugrul Kaya²

İlker Akmirza³

Ezgi Erdogan³

Abdullah Çubukçu⁴

¹ Çanakkale Onsekiz Mart University, Çanakkale -Turkey

² Okan University, Istanbul - Turkey

³ Istanbul Technical University, Istanbul - Turkey

⁴ Istanbul Metropolitan Municipality, Istanbul – Turkey

ABSTRACT

This paper aims to determine the air quality effects of 15 quarries with 108,000 tons per day capacity located in İstanbul Cebeci region. South, east and west site of the quarries are surrounded by settlement areas and residential premises that approximately population of 485,000 people. Due to the high capacity of the facilities and there are large settlements nearby, it is important to determine their air quality effects on the region. For this purpose, PM₁₀ and SO₂ measurements were made at a representative point and the results were evaluated between the dates of 27th July and 22nd October 2012; and 1st April and 16th July 2013. According to results, in terms of SO₂ there was no determined effect on air quality. On the other hand, in terms of PM₁₀ parameter, the results indicated that the measured levels are 3-5 times higher than the other points in İstanbul at the same timespan. During the 112 days of measurements, PM₁₀ parameters have exceeded the European Union threshold value of 50 µg/m³ for 106 days, and exceeded the Air Quality Evaluation and Management Regulation's 2012 Turkey threshold value of 180 µg/m³ for 57 days. During the 76 days of measurements, PM₁₀ pollution parameters have been exceeded the European Union threshold value of 50 µg/m³ for 74 days, and exceeded the Air Quality Evaluation and Management Regulation's 2013 Turkey threshold value of 140 µg/m³ for 60 days. These results indicate us, unsupervised operation of the facilities negatively effect on the region air quality and the health state of the people live in the region.

Keywords: PM₁₀, SO₂, air quality, quarry

HABITATION QUALITY EVALUATION MODEL

Prof. Dr. Eng. Lidia Niculita¹

Assist. Prof. Dr. Eng. Florinela Ardelean¹

Prof. Dr. Cristian Ioja²

¹ Technical University of Civil Engineering Bucharest, Faculty of Engineering Installations, **Romania**

² Bucharest University, Faculty of Geography, **Romania**

ABSTRACT

This article presents the results of support research, done in order to develop environment management systems, based on an evaluation model of environment quality in current and future habited areas, which would lead to impact reduction of waste products on the environment and improvement of habitation quality in residential areas, by using scientific models and methods. Knowing the fact that waste sources are greenhouse effect generators, the possibility of developing some economic mechanisms appear, mechanisms that have the purpose of adapting residential areas to current climate change. The elaborated evaluation model regarding environment quality within urban residential areas is a mathematical model, based on reality and generalization, by emphasizing some cause – effect relations, can be considered an instrument for improving the quality of life in urban ecosystems and it's built using a multi criteria analysis. The categories of factors that influence the realization of the habitation quality model are also emphasized. Finally, the results of applying the model are presented through the realization of a case study for a representative urban congestion – Bucharest metropolis.

Keywords: interior air quality, thermal comfort, residential building, habitation model

HEAT WAVES AND THEIR ESTIMATED SOCIO-ECONOMIC IMPACT IN BUCHAREST CITY, ROMANIA

Assoc. Prof. Dr. Adina-Eliza Croitoru¹

Assoc. Prof. Dr. Raluca Ioana Antonie²

Prof. Assist. Adina Rus³

¹Babes-Bolyai University, Faculty of Geography, **Romania**

²Babes-Bolyai University, Faculty of Political, Administrative and Communication Sciences, **Romania**

³Babes-Bolyai University, Faculty of Economics and Business Administration, **Romania**

ABSTRACT

Heat waves are one of the most important extreme phenomena that are subject to important changes under present global warming conditions. In this study a complex analysis of heat waves over a period of 53 year (1961-2013) was performed. Daily maximum temperature data have been used in order to detect the heat waves based on 95th percentile threshold. Then the annual series of number of heat waves, their mean and maximum duration, as well as their cumulated duration have been constructed. The four series were then subject to trend detection by employing Mann-Kandall and Sen's slope methods. The main results are: statistically significant increase was detected in all four parameters time series considered; the maximum annual values of the parameters are about four times higher compared to the mean annual number calculated for the entire period. The estimated social and economical impact is important to be determined in terms of response at community level, institutional level as well as at individual level. The impact could first imply modification regarding the consumption of electricity and major differences in the daily consumption basket. Also, as a direct consequence of heat waves it is expected the hospitalization costs increase due to the number of heat induced casualties and a decrease in the work performance resulting in an estimated loss in Gross Domestic Product.

Keywords: heat waves, trend, socio-economical impact, Bucharest city, Romania

**HOW PROTECTED ARE WE INDOOR?
INDOOR AIR POLLUTION WITH PARTICULATE MATTER IN AN OFFICE
BUILDING FROM BUCHAREST**

Elena Bucur, Mihaela Petrescu,

Gabriela Vasile, Luana Pascu, Raluca Diodiu

National Research and Development Institute for Industrial Ecology – INCD ECOIND,
Bucharest, **Romania**

ABSTRACT

This paper presents the results of an indoor air quality monitoring study conducted in an office building located on the outskirts of Bucharest, in an area characterized by low traffic and no major industrial pollution sources, during the summer of 2013, from 14th of June to 3rd of July. The aim was to determine the concentration of particulate matter dimensional fractions PM_{2.5} (particulate nominal diameter less than 2.5 μm), PM₁₀ (particulate nominal diameter less than 10 μm), Total Suspended Particles (TSP), the PM_{2.5} and PM₁₀ percent from TSP, metals and also the water-soluble anions present in the particulate matter in indoor air. The concentration of particulate matter varies widely from a minimum of 11.93 μg/m³ for PM_{2.5} in weekend up to a maximum of 86.75 μg/m³ in a working day with intense activity. The PM_{2.5} average concentration for the period was 42.64 ± 28.28 μg/m³; for PM₁₀ it was determined a period average of 44.09 ± 28.29 μg/m³ and 46.44 ± 30.41 μg/m³ for TSP. The particulate matter are composed mostly of fine particles; so PM₁₀ contains a 96% of PM_{2.5} and total suspended particulates are form from 91% of PM_{2.5}. Analysis by ICP- EOS technique for the acid mineralization of the particulate matter retained on the filters lead to the identification of 15 metals: K, Ca, Fe, Al, Na, Mg, Pb, Zn, Ni, Ba, Cu, Ti, Mn, As, Cr. The metal content in the three dimensional fractions is different, indicating the probability existence of an indoor source for particulate matter with metals. Regarding the content of water-soluble anion in the three dimensional fractions, were identified following ions: NO₃⁻ > SO₄²⁻ > Cl⁻ > F⁻ > PO₄³⁻ > NO₂⁻. Pearson Correlation Analysis indicated a high correlation between all the dimensional particulate fractions and also between metals and anions present in particulate matter. As so, the correlation coefficients for metals have values of R=0.96 for PM_{2.5}/PM₁₀; R=0.93 and R=0.88 for TSP/PM₁₀ for PM_{2.5}/TSP. The high correlations were maybe obtained due to the composition of the PM₁₀ and the TSP, both consisting in PM_{2.5} particulates in percentage of over 90%.

Keywords: indoor air, PM_{2.5}, PM₁₀, metals, anions soluble in water.

IDENTIFICATION OF POWER FACTOR IN MARINE ELECTRICAL GRID

PhD. Grzegorz Nicewicz

MSc. Michał Sosiński

PhD. Dariusz Tarnapowicz

Maritime University of Szczecin, **Poland**

ABSTRACT

The load factor of marine auxiliary engines is one of the basic information for the calculation of air pollutants emission generated by ships. The load factors for different types of ships, determining the results of emission calculations, are provided in various reports with greater or less approximation.

For auxiliary engines, reports of the world's organizations, dealing with air pollutants emissions, present statements of load factors depending on the type of vessel and operating conditions. These statements are prepared on the basis of data collected from registers of ships, log book records and interviews with captains of ships, chief engineers and officers of pilot stations.

Determined in such a manner auxiliary engines load factors are not very precise. This is mainly due to the lack of empirical data on real operating load values of marine electric power systems. The data in the various types of reports sent periodically by chief engineers to ship owning companies technical services, supervising the operation of ships, are too residual. In addition, the load of marine generating sets read from power meters built in Main Switch Board or marine power plant alarm system control panel in Engine Control Room is not equivalent to the load of auxiliary engines. The load of auxiliary engine must be calculated taking into account the engine excess power factor to generator and the efficiency of generator. Unfortunately, in the case of data collected by the ship classification societies, there is no information on the efficiency of generators, the auxiliary engines excess power factors to generators or auxiliary engines continuous power, but only a nominal value of generating sets active power, understood as the active power of generators.

Therefore, the authors developed a method for determining the load factors of marine auxiliary engines in ports in hoteling mode for different types of ships based on identification tests of marine electric power systems load. Description of the method and the results were presented in [1, 2]. The analysis [1, 2] were carried out for constant value of generator efficiency $\eta_G = 0.95$ due to lack of operational data. Unfortunately, the efficiency of generator depends on the load and power factor ($\cos\phi$). The influence of character of marine generating load ($\cos\phi$) on generator efficiency will be analyzed in the paper based on the operational data from modern container ship in all operational conditions.

Keywords: emission of air pollutants by ships, load factor of marine auxiliary engines, generators efficiency

IMPACT OF SMALL HEATING SOURCES ON AIR QUALITY

Assoc. Prof. Dr. Jana Müllerová

University of Zilina, Slovakia

ABSTRACT

Increasing number of small heating sources in households means an increasing number of solid fuel pollutants. Many European households turn from gas to less green - wood combustion. Their impact on overall air quality has increasing trend in Slovakia, although other industries are decreasing the emissions of air pollutants. Small heating sources have around 15% share in air pollution by Particular matters. There are Huge pollutants with much more significant impact on air quality. The greatest one is US Steel which produces more than 50% of all the pollutants in entire country. This fact can be hardly changed. Smaller heating sources can be exchanged much easier. The paper focuses on CO, NO_x, and PM₁₀ matters measured in number of tests. The measurements taken in National Laboratory show the importance of proper wood combustion in wood gasifying boilers in order to maximize its efficiency and decrease the air pollutants emission. There are hundred thousand boilers installed, mostly old ones with high emissions in Slovakia. The most complicated for boiler producers is to decrease the CO emissions to minimum in order to meet actual EN requirements. There are expensive technical solutions or the fuel must be changed to high quality biomass – wood pellets. Classical steel or cast iron hot-water boilers are not able to meet the emission criteria without modification of their construction. Wood gasifying boilers can meet the criteria for CO and PM especially in laboratory conditions.

Keywords: Air pollutant, domestic boilers, emissions, Stationary sources, particular matters.

IMPACT OF TRANSPORT ON AIR QUALITY IN GJILAN TOWN OF KOSOVO– PARTICULATE MATTERS

Assoc. Prof. Dr. Ferat Shala¹

Rizah Hajdari²

Letafete Latifi²

Msc. Halil Demolli¹

Shkumbin Shala²

¹University of Prishtina - Faculty of Mechanical Engineering-Department of traffic, **Kosovo**

²Kosovo Environmental Protection Agency, **Kosovo**

ABSTRACT

Kosovo has an area of 10908 km², with a network of 2,005 km road, and around 211300 vehicles in circulation. Most of these vehicles are older than 10 years, and do not meet the air emission technical requirements. Given the technical conditions of vehicles in use, the conditions of the road infrastructure, and the level of use of vehicles in traffic, the air quality in Kosovo is significantly affected.

This paper presents results of measurements and analysis of the particulate matters (PM) in ambient air in Gjilan town of Kosovo. The actual level of PM in Gjilan town is compared with standards (limit values) of EU Directive 2008/50/EC; and with Kosovo national regulation 02/2011 on limit values and air quality standards. Measurements are made using the automatic GRIMM analyzer. The Analyzer is placed in the proper location, near the main road in order to register the impact of traffic on PM concentration in the air, and to avoid recording the emission from other sources. Measurements included period 01 July 2013 - 31 March 2014, both summer and winter seasons. A comparison between the two seasons was conducted to calculate the impact of other factors in the concentration of PM in ambient air.

From this research is evidenced that the PM annual average value during 2013 achieved 70.9 ug/m³. The transport sector is considered to be the main emitter of primary PM, namely motor vehicles such as cars, trucks, and buses which emit direct PM from their tailpipes, as well as from normal brake and tire wear.

This paper concludes that transport is a very high contributor of the air pollution in Gjilan town, which directly affects human health, since the gases emitted from transport are very close to recipient (humans). Exposure to PM causes a series of significant health problems, including aggravated asthma, chronic bronchitis, decreased lung function, and premature death

Keywords: Particulate matters, transport impact, air quality, monthly average, annual average

**INDICATION OF CLIMATIC CHANGES THROUGH THE INORGANIC
COMPONENTS IN DIATOMS (HOVSGOL)**

Dr. Liudmila Pavlova

Ms. Liliya Tkachenko

Dr. Arcadiy Goreglyad

Acad. Mikhail Kuzmin

Vinogradov Institute of Geochemistry, Siberian Branch, Russian Academy of Sciences, **Russia**

ABSTRACT

Compositions of diatom valves have been for the first time obtained for the intervals of their distribution in two sedimentary sampling depth using the EPMA technique developed earlier. The investigations were performed using electron microscopes Quanta and microprobe JXA8200. The comparison of the inorganic element concentrations suggested some regular features in the change of diatom valve composition throughout the sampling depth. The sampling intervals which contain poorly-preserved valves show higher carbon and lower SiO₂ contents. The comparison with the literary spore-pollen analysis exhibits the correlation between steppe/forest interface and areas with high and low SiO₂ content. Such correlation cannot be random and most likely indicates the prospects of using this procedure. The obtained data can be used as indicators of climatic changes at certain periods of diatoms' life (cold or warm).

Keywords: diatom algae valves, microprobe, climate, Hovsgol, Baikal

INFLUENCE OF METALLURGICAL INDUSTRIES ON ATMOSPHERIC DEPOSITION IN THE AREA OF KOŠICE (SLOVAKIA)

Dr. Jozef Hančulák

MA. Tomáš Kurbel

Dr. Lenka Findoraková

Dr. Tomislav Špaldon

Dr. Oľga Šestinová

Dr. Erika Fedorová

Slovak Academy of Sciences, Institute of Geotechnics, Department of Environment and Hygiene in Mining, Košice, **Slovakia**

ABSTRACT

Total atmospheric deposition i.e. both wet and dry ones, was sampled in the urban and suburban area in the vicinity iron and steel works, the largest industrial source of air pollution in Slovakia. The eleven sampling sites have been placed on the roof above the height of the surrounding buildings at a distance between 1 and 15 kilometres from main source of pollution. Qualitative and quantitative characteristics of the total deposition of solid particles, the deposition fluxes of trace elements (Fe, Al, Mn, Zn, Pb, Cu, Cr, Cd, As), major ions (SO_4^{2-} , NO_3^- , Cl^- , F^- , Ca^{2+} , Mg^{2+} , Na^+ , K^+ , NH_4^+), their seasonal variations and the enrichment factors of these elements were studied. The atmospheric deposition fluxes of trace elements were determined separately for “water soluble” and “insoluble” phase. The obtained results from the years 2009–2013 are pointed out significant influence of the iron and steel works on the studied parameters of atmospheric deposition.

Keywords: atmospheric deposition, trace elements, ions, emission, metallurgy

**LUNGS VITAL CAPACITY OF THE STUDENT'S GROUP-AGE 17-18 YEARS,
IN MITROVICA AND DRAGASH, KOSOVO**

Assoc. Prof. Dr. Kemajl Bislimi,

MSc. Avni Behluli, PhD candidate

MSc. Fahri Osmani,

MSc. Ilir Mazreku,

MSc. Iliriana Demaj,

Assoc. Prof. Hazbije Bojniku

Prof. Dr. Fetah Halili

University of Prishtina "Hasan Prishtina", **Prishtina, Kosovo**

ABSTRACT

This research aimed to evaluate the effect of industrial and traffic pollution in the lungs vital capacity of the students' ages 17-18 years. The implication of gender and body surface area in student's lung vital capacity, were also investigated. In this research were included 360 students of both sexes from the Mitrovica and Dragash urban centers. Mitrovica city considered as a locality with varying degrees of urban and traffic pollution, while Dragash is a locality unaffected by these pollution forms. The research results show that students who attend school in the city of Mitrovica, had a lung vital capacity significantly lower, compared to their peers from Dragash city ($P < 0.01$), despite the fact that students from Mitrovica had higher body surface area (1.83 m^2 for males and 1.58 m^2 for females) compared to the students from Dragash (1.75 m^2 for males and 1.55 m^2 for the females). To measure the lung vital capacity the spirometry method was used the type of Harvard spirometer 9000 ml respectively. While body surface area, was calculated using Dubois formula, from the body weight and body height. Statistical calculations of the results were done by various statistical software's, such as ANOVA and Student t-test.

From the results of this research could be concluded that changes in respiratory parameters, lung vital capacity respectively, are a suitable indicator to assess the impact of pollution on human health.

Keywords: Vital capacity, lung, spirometer, students, pollution

METHODOLOGY FOR EMISSION QUANTITY ASSESSMENT IN LOCAL ROAD TRANSPORT

Dr. Jana Kodymová

VSB- Technical University of Ostrava, Faculty of Mining and Geology, Ostrava- Poruba,
Czech Republic

ABSTRACT

Air protection and emission production is a currently important topic, mainly in terms of greenhouse gas emissions. In the Czech Republic emission analyses of major air pollutants (PM, SO₂, NO_x, CO) have been done since 1994. These emission analyses are executed by the Czech Hydrometeorological Institute, whose founder is the Ministry of the Environment of the Czech Republic. This article briefly introduces emission productions in the Czech Republic. The emissions analyses are structured according to the main pollution groups/categories (large, medium and stationary sources of air pollution and mobile sources of air pollution), including the legislative context. Attention is also paid to the determination of the traffic intensity and the average amount of traffic emissions in a specific part of one road in Ostrava City. In this way emissions are calculated for the dispersion study in the Czech Republic. This type of emission analyses are processed for the same part of the road periodically. This road belongs among those with the most intensive traffic in the centre of Ostrava City (the third largest city in the Czech Republic). Information about traffic intensity is collected by students within a students' project once a year (during October and November). The results are subsequently compared with the national traffic census, done by the Directorate for National Roads and Motorways every 5 years.

Keywords: PM, SO₂, NO_x, CO, emission, traffic, Czech Republic, Ostrava City

**MODELLING OF AIR POLLUTION BY EMISSIONS OF HEAVY METALS
PRODUCED FROM UNCONTROLLED WASTE COMBUSTION IN SMALL
HOUSE BOILERS**

Dr. Mária Koščová, Dr. Viliam Carach,

Assoc. Prof. Dr. Jozef Mačala, Assoc. Prof. Dr. Katarína Kysel'ová,

Dr. Mário Molokáč, Dr. Ladislav Hvizdák,

Dr. Slavomír Drevko, Ing. Juraj Čorba

Technical University of Košice, **Slovakia**

ABSTRACT

At present a waste incineration in households is a great problem. In municipalities with established separate waste collection, the question about waste recovery is partially resolved. In municipalities where separate waste collection is not possible or is not established, citizens use mainly combusted waste as alternative fuel for domestic boilers. Air quality declines especially in winter period of the year. In local house boilers are combusted common fossil fuels (natural gas, lignite, coal, wood, biomass) but also household waste, for example plastic waste, paper, paper and plastic packaging covers, rubber materials etc. Municipal waste contains heavy metals and many hazardous substances as shown in chemical analysis, which are resources of air pollutant emissions. From house stacks, these are emitted to free atmosphere. By chemical analysis of common household wastes we can calculate emission rate for existing pollutants. Using the air quality models, respectively air dispersion models we can calculate local air quality on local level. This article deals with the model calculation of air pollution by emissions of heavy metals (As, Cd, Cr, Cu, Hg, Pb, Sb) produced from uncontrolled waste incineration in small house boilers. By dispersion models we can calculate expected air quality for standard fossil fuels and household waste.

Keywords: air pollution, solid municipal waste, air quality modeling, boilers

NUMERICAL SIMULATION OF PM DISPERSION DURING THERMAL INVERSION

Eng. Irena Pavlikova

Eng. Ondrej Zavila, Ph.D.

M.A. Jan Bitta, Ph.D.

Eng. Marian Bojko, Ph.D.

Ass. Prof. Petr Jancik, Ph.D.

VSB – Technical University of Ostrava, **Czech Republic**

ABSTRACT

The goal was to describe the ground atmospheric layer flow over complex terrain during specific temperature stratification and low wind flow using the Computational Fluid Dynamic (CFD). The numeric simulation was run for the model area of the Horní Lomná valley. The automatic transport of terrain from geographic information system to CFD interface was made, the real boundary weather condition was applied and the flow of particulate matter in the valley from various sorts of pollution sources was studied. The simulation was compared with the Gaussian dispersion model and the pollution measurement data.

Keywords: CFD, fluid dynamic, complex terrain, thermal inversion

OPTIMAZING A METEOROLOGICAL OBSERVING NETWORK BY GEOSTATISTICAL ESTIMATION VARIANCE APROACH

Dessislava Denkova

National Institute of Meteorology and Hydrology, **Bulgaria**

ABSTRACT

Monitoring is fundamental for meteorology .The quality of the data and profitability depends on optimal design of monitoring network. There are different approaches and methods for optimizing the network. Geostatistical estimation variance reduction is one of the unbiased ways of optimizing a meteorological network with a desired accuracy. The existing meteorological network in Bulgaria is consisting of 126 climate monitoring stations. The air temperature data received from them were analyzed geostatistically to reason the spatial variability oh the parameter. The threshold on the maximum standard deviation of the estimation error was defined by comparing with the standard deviation of the data to maintain the order of magnitude. The calculation of the geostatistical estimation error is independent of the measured values so the variance of the estimation error of an uniform grid was calculated to be compared with the threshold. Using this procedure for a given network, is shown an way for its optimizing with a fixed accuracy in the form of maximum permitted variance of the estimation error.

Keywords: monitoring network, optimization, estimation error, air temperature

PARTICLE POLLUTION IN URBAN AND NON-URBAN AREA

Ing. Dušan Jandačka, PhD.¹

Doc. Ing. Daniela Ďurčanská, CSc.¹

¹ University of Zilina, Faculty of Civil Engineering, Department of Highway Engineering, Slovakia

ABSTRACT

Particulate matter (PM) is one of the striking pollutants and causes appreciable degradation of the environment and therefore the quality of life of the population. Formation of particulate matter resulting from vehicular traffic is a problem especially within large cities. Exhaust gases contain large amounts of gaseous and solid pollutants when considering the use of internal combustion engines. These include in particular the presence of large numbers of extremely fine particle fractions, which can remain in the air for a long period of time, easily penetrate and attack the respiratory tract and damage, impact on the health of humans. Particulate matter with a greater aerodynamic diameter originates previously from different parts of cloths road and vehicles. The subject of this presentation is monitoring particulate matter along the cycle of its creation alongside urban roads and non-urban roads and an evaluation of fraction ratios PM₁₀, PM_{2.5} and PM₁ with regard to meteorological conditions and traffic volume.

Keywords: particulate matter /PM/, meteorological conditions, traffic volume, regression analysis

PARTICULATE MATTER PRODUCTION IN TERM OF DIFFERENT TYPES OF WEARING COURSE ASPHALT MIXTURES

Assoc. Prof. Dr. Matus Kovac

Dr. Dusan Jandacka

Assoc. Prof. Dr. Daniela Durcanska

Dr. Lubomir Pepucha

University of Zilina, Faculty of Civil Engineering, **Slovak Republic**

ABSTRACT

Sources of air pollution with reference to particulate matter which originate from the automotive traffic can come either from combustion processes, or non-combustion processes. Non-combustion emissions of particulate matter produced by automotive traffic may come from the tires wear, wear of the braking pads and callipers, lining of brakes, abrasion of road pavement, wear of mechanical clutches, car bodies, and re-suspension of dust collected on the pavement. It is difficult to identify the road pavement abrasion as the direct source of particulate matter in field and separate it from other sources as well as quantify its share on the origination and presence of particulates. One of the possible ways is to approach the chemical analyses of particulate matter as well as multi-layer statistical analyses. But even then it is indispensable to be aware of which chemical substances are to be considered as prime suspects for a given source – to be contained and released by the road pavement surface. The main goal of that experiment was to determine the particulate matter production of various types of asphalt mixtures (various in composition, especially particulate size distribution, maximum grain size, content and type of bitumen binder used). Different asphalt mixtures composition influences particularly the texture of the pavement surface. There was searched the relationship between particulate matter production caused by rolling a wheel across the surface of an asphalt mixture specimen and the pavement surface texture characteristics measured and evaluated by means of 3D scanner with high resolution.

Keywords: air pollution, particulate matter, asphalt mixtures, surface texture, wheel tracking test

**PREDICTION OF METALLURGICAL GASEOUS EMISSIONS SPREADING
OUTSIDE OF THE INDUSTRIAL CENTERS**

D.I. Orelkina

Prof. DSc A.L. Petelin

Prof. DSc Y.S. Yusfin

Ph.D G.S. Podgorodetskii

A.A. Novikov

National University of Science and Technology MISiS, **Russia**

ABSTRACT

The propagation of gaseous emissions of metallurgical industry has been investigated. The main factors responsible for the transportation of gaseous emissions over large distances are identified. A general approach to predicting the spatial distribution of gaseous emissions at large distances from metallurgical enterprises is proposed. The principle of maximum danger was used as a basis for predicting.

Keywords: air pollution, metallurgical gaseous emissions, concentration field, wind rose, chemical kinetics

A QUALITATIVE ANALYSIS OF EXTRAORDINARY METHODS OF CARBON SEQUESTRATION

Prof. Mgr. Juraj Ladomerský, CSc.¹

Dr. Emília Hroncová^{1,2}

¹Matej Bel University in Banská Bystrica, Faculty of Natural Sciences, Department of environmental management, **Slovakia**

²Technical University in Zvolen, Faculty of ecology and environmental sciences, Department of environmental engineering, **Slovakia**

ABSTRACT

Biological waste represents a resource of greenhouse gases. But various ways of treatment with biological waste caused different greenhouse gas production. Considering greenhouse gas production, the energy, material, and substance advantages of waste utilisation can differ noticeably, given the various processes of biological waste handling. Under certain conditions, waste treatment does not necessarily lead to carbon dioxide production in the short-term – when organic mass is applied into the product and in multiple recycling.

The pyrolytic treatment of biological waste, producing pyrolytic coal (coke), and its subsequent deposition into soil represents a hitherto underutilised potential reduction of CO₂ and CH₄ production from an otherwise unutilised organic waste.

In Slovakia, there is significant interest in investments in the production of compost from biologically decomposable municipal waste and sludge from wastewater treatment plants for energy uses. According to our experience, the appropriateness of energy-compost utilisation for specific energy devices has to be verified from the technical standpoint as well as regarding air pollution during the trial operation for appropriateness verification of new fuel.

Through the anaerobic digestion of separated bio waste, or of suitable industrial waste, biogas and digestate are simultaneously obtained as soil fertilizer, usually after composting. CO₂, NO_x, and low concentrations of other substances are the products of biogas combustion.

Environmentally appropriate handling of waste dump gases represents a substantial contribution to the reduction of anthropogenic emissions of greenhouse gases.

Incorporating organic carbon into soil is an inadequate way of reducing greenhouse gas production. A potential for CO₂ sequestration also has some inorganic waste. This paper describes an elementary qualitative analysis of selected procedures of carbon sequestration using wastes.

Keywords: pyrolysis, sequestration, biological waste, red mud, soil

**RECONSTRUCTION OF THE LAKE SHIRA LEVEL CHANGES IN THE
LAST 1500 YEARS USING GEOCHEMICAL INDICATORS.**

Dr. Natalya Maksimova¹

Dr. Andrey Darin¹

Dr. Ivan Kalugin¹

Dr. Tatiana Markovitch¹

Dr. Yakov Rakshun²

Dmitriy Sorokoletov²

Fedor Darin²

¹ Institute of geology and mineralogy SB RAS - **Russia**

² Institute of nuclear physics SB RAS - **Russia**

ABSTRACT

Meromictic Shira Lake is a good representative object for detail climate modeling due to its local hydroclimatic information and annually laminated bottom sediments. For geochemical research was used method of scanning microanalysis with synchrotron radiation. We used a one dimensional scanner and a system for collimating and focusing the beam that allowed us to perform measurements of more than 20 minor elements with detection limits of ~1–5 ppm in cores of bottom sediments with a spatial resolution of 100 µm. The applied experimental apparatus allowed us to reach a new quality of paleoclimatic reconstructions with annual time resolution.

Keywords: Shira Lake, bottom sediments, scanning microanalysis, synchrotron radiation, lake level, reconstruction.

SENSITIVITY EXPERIMENTS WITH REGIONAL CLIMATE MODEL RegCM TO BE USED FOR BULGARIA

Assoc. Prof. Dr. Todor Todorov,

Tihomir Denev,

Assis. Eng. Krastina Malcheva

National Institute of Meteorology and Hydrology (NIMH), **Bulgaria**

ABSTRACT

The regional climate model RegCM, is a community model, constantly improving towards accuracy and flexibility for use. Being at the beginning of its application at the National Institute of Meteorology and Hydrology (NIMH) – Bulgarian Academy of Sciences, the model has to be adjusted for better representation of the results obtained when making a comparison with observations for the territory of Bulgaria. This requires tuning by varying many input parameters, including the possibility for choice of different parameterization schemes.

In this work are presented some results from the sensitivity analyses, carried out with the model version 4.4rc8, and comparison of these results with observations at 11 meteorological stations on the territory of the country for year 1990. The numerical simulations are provided applying sub-grid modeling and horizontal resolution 10 km. Comparison concerns monthly and seasonal mean temperatures and total precipitations.

The comparison shows the best results for precipitations when using the Tiedtke's scheme and for the temperatures - the Emanuel's scheme. There is still additional need to adjust the input parameters for better results concerning the territory of Bulgaria, including the use of different datasets.

Keywords: regional climate model, sub-grid modeling, climate, temperature, precipitation

SHIPPING AIR POLLUTION ASSESMENT. STUDY CASE ON PORT OF CONSTANTA

Associate Professor Dr.Eng. Florin Nicolae¹,

Associate Professor Dr. Cătălin Popa²,

Professor Dr. Eng. Haralambie Beizadea¹,

¹ Faculty of Navigation and Naval Management, Naval Academy Mircea cel Batran, Constanta,
Romania

² Higher Colleges of Technology, ADMC Business Faculty, Abu Dhabi, **United Arab Emirates**

ABSTRACT

International statistics prove that, nowadays, naval transportation represents an important source of air pollution. Black Sea, as closed sea, is defined by a significant and increasing naval traffic. In this framework, noxes emissions from the ships can affect the people health and the environment. Furthermore, sustaining this point of view, the work paper is revealing within an overtaken analysis, the future rate of naval transportation noxes volume, recorded within the period of 2006-2012. In this respect, the authors have made an overall ship operation synthesis focused on pollution agents, within the mentioned period of time, in the studied area of Constanta port. The chosen ship model has been defined based on dedicated statistics as of cargo types, technical operation endowment offered by specialized terminals etc. For the ship model were calculated the major air pollution agents, based on particular computing algorithm. The obtained results may be further used for assessing the impact against the environment in port administration politics, considering some predefined parameters for ships as its tonnage, propelling systems, engine type etc.

Keywords: air pollution, shipping industry.

STUDIES ON CLIMATE VARIABILITY IN THE ARBIL AREA, IRAQ

Assoc. Prof. Dr. Elena Constantin¹

Assoc. Prof. Dr. Kinan Kadir²

Lecturer Dr. Claudiu-Sorin Dragomir¹

Prof. Dr. Florin Mărăcineanu¹

¹ University of Agronomic Science and Veterinary Medicine Bucharest, **Romania**

² Faculty of Agriculture, Arbil, **Iraq**

ABSTRACT

Climate variability manifest on the entire planet poses a real threat to the existence of humankind, resulting in in-depth studies aimed to find mitigation solutions. For this purpose, the findings presented in this article refer to a geographic area where rainfall variability and air temperature were studied by calculating several climate indices (de Martonne, Lang, and de Martonne-Gotman) on ten-year successive intervals, between 1980 and 2008. In the Arbil area, Iraq, there is a decreasing trend in the annual rainfalls and variability recorded each year, particularly over the last decade. Climate indices and the frequency of certain climate phenomena show that the climate evolves towards aridity in this area.

Keywords: climate changes, climate indices, aridity index, geographic latitude, geographic longitude

STUDY ON MATHEMATICAL MODELING OF THE DISPERSION SULFUR DIOXIDE BY BURNING FOSSIL FUELS

Assoc. Prof. Dr. Daniela Cîrțină

Lect. Dr. Irina Pecingină

Prof. Dr. Liviu Cîrțină

”Constantin Brancusi” University of Targu-Jiu, **Romania**

ABSTRACT

The modeling improves the effectiveness of air quality management because in this way can be calculated, predict and estimate the levels of pollutants in the ambient air and can identify the contribution of different categories of sources exceeding the limit. This paper presents a dispersion modeling of sulfur dioxide generated by the emission sources associated activities carried out by the power plants based on fossil fuels, in the Rovinari Energy Complex, Romania. In this study has been analyzed the impact of the operation of these emission sources on air quality, in two distinct activities: activity 1 aims to assess the existing pollution fund, due to other emission sources at regional and local level and activity 2 aims to assess the impact on air quality due solely to the operation of large combustion plants of the Rovinari Energy Complex, considering their performance in five different scenarios, before and after the start of the desulphurisation installation for the four energy blocks. The choice of scenarios was made in order to observe the temporal variation of the SO₂ pollution levels generated by the operation of four energy blocks of the Rovinari Energy Complex, as a result of equipping them with desulphurisation plant of the flue gas from the worst case to ambient air quality corresponding to the first scenario. Dispersion model used TAPM (The Air Pollution Model) is combined model meteorology – dispersing and the modeling results are presented as maps of pollution. The maximum values obtained by modeling of pollutant concentrations analyzed, on different averaging intervals, have been reported for each activity and screenplay by modeling, at the limit values set by legislation on ambient air quality of Romania. From the recorded data shows that impact on air quality due solely to the operation of large combustion plants belonging to Rovinari Energy Complex is extremely high, maximum concentrations from SO₂ obtained by modeling hovering well above the appropriate limit values for four of the five scenarios studied.

Keywords: pollutant, dispersion, mathematical modeling.

STUDY ON POSSIBILITIES OF REDUCING NO_x EMISSIONS AT CTE ROVINARI BY SPLIT INJECTION OF COMBUSTION AIR

Assist Prof. Dr. Adriana Foanene

Eng. Lucica Anghelescu

Assoc. Prof. Dr. Bogdan Diaconu

Prof. Dr. Mihai Cruceru

Assist Prof. Dr. Adina Tătar

University "Constantin Brâncuși" of Tg-Jiu, **Romania**

ABSTRACT

This paper studies the influence of split injection of combustion air on NO_x emissions. Reduction of NO_x emissions is achieved through a series of functional and constructive measures aimed at reducing NO_x in the furnace of the boiler. NO_x formation depends on the amount of nitrogen in the fuel and the amount of combustion air injected into the furnace with fuel. If the nitrogen content in the fuel can not be adjusted, the secondary air introduced into the furnace can be modulated.

Secondary combustion air introduced into the furnace with fuel can be reduced to the extent that it further provides stable ignition and combustion of the fuel. Reduction of the amount of air introduced through the burners causes a shortage of air into the burner, leading to an increase in the content of carbon monoxide (CO) and mechanical un burn in the flue gas. This effect is compensated by placing the top of the combustion air (tertiary air) in one or more areas located between the outlets of the furnace burner output. It realizes the so-called fractional combustion air. Tertiary air to be introduced in order to ensure the best possible mixing of the combustion gases with secondary air, the excess air necessary to ensure that the output of the furnace to ensure complete combustion and prevent slagging. The excess air is small; the quantity of formed nitrogen oxide is low.

Thus the paper examines several options for introducing secondary air establishing the optimal solution.

Keywords: emission, combustion air, pollution, split injection, nitrogen oxide.

TEMPERATURE INDICES OF CLIMATE CHANGE IN GEORGIA

**Assoc. Prof. Dr. Mariam Elizbarashvili¹, Phd student Davit Mikava²,
Phd student Bagrat Kikvadze², Phd student Nano Gogia¹,
Phd student Ina Keggenhoff³, Dr. Nato Kutaladze⁴, Mate Managadze²**

¹ Ivane Javakhishvili Tbilisi State University, **Georgia**;

² Ilia State University, Tbilisi, **Georgia**;

³ Justus-Liebig-University Giessen, **Germany**;

⁴ The National Environmental Agency, **Georgia**

ABSTRACT

Based on the observation data of meteorological stations in Georgia, spanning the period from 1936 to 2011 several Temperature Indices of Climate Change have been researched. These indices are among 27 core climate change indices developed by the World Meteorological Organization and Expert Team on Climate Change Detection, Monitoring and Indices (ETCCDMI) of the intergovernmental commission on climate change.

Geoinformational maps of spatial structure have been built and the dynamic of the indices over the period of global warming have been studied. Average values of several Temperature indices of Climate Change for various averaging times have been determined.

Keywords: Temperature Indices, Climate Change modeling

**THE AGE MODEL SEDIMENTATION IN LAKE SHIRA (KHAKASIA,
RUSSIA) USING VARVES COUNTING AND RADIOCARBON
DETERMINATIONS**

Dr. Andrey Darin¹

Dr. Ivan Kalugin¹

Dr. Natalya Maksimova¹

Dr. Tatiana Markovitch¹

Dr. Yakov Rakshun²

Dr. Denis Rogozin³

Dmitriy Sorokoletov²

Fedor Darin²

¹ Institute of geology and mineralogy SB RAS - **Russia**

² Institute of nuclear physics SB RAS - **Russia**

³ Institute of biophysics SB RAS - **Russia**

ABSTRACT

Meromictic Shira Lake is situated in the semi-arid climatic area of South Siberia. The lake has a size of 5 × 9 km and a maximum depth of 24 m. A sediment column of 155 cm in length was retrieved in the deepest part of the lake. The sediment has thin laminated structure, where black clay carbonate organic-bearing layers are coupled with white organic free ones. Thickness of coupled rhythms varied from 2 mm in the uppermost 20 cm of core to 0.4 mm close to the bottom. For calculation of the layers were used pictures of wet core, optical thin sections and geochemical indicators, marking each annual layer. For dating the depth of the core were used AMS data ¹⁴C content, the activity of ¹³⁷Cs and ²¹⁰Pb. Comparison of age model, obtained by counting annual layers with radiocarbon data, showed that the «reservoir effect» in Lake Shira is equal 1275 years. Radiocarbon data reduction by this amount gives a good coincidence all results.

Keywords: Shira Lake, bottom sediments, annually laminated layers, varves, scanning microanalysis, synchrotron radiation.

THE ASSESSMENT OF THE AIR QUALITY IN THE REVITALIZED LOCALITY OF THE MOST LAKE

Ing. Milena Vágnerová

Ing. Jan Brejcha

Ing. Lenka Vaidišová

Výzkumný ústav pro hnědé uhlí a.s., **Czech Republic**

ABSTRACT

The opencast mines in the region of the North-Bohemian basin are and will be in the close future step wisely closed. The planned and realized reclamation procedure in the foot of the Krušné hory (the Ore Mountains) is based on the constitution of the artificial lakes dedicated mainly to the recreation purposes. The hydrological reclamation represents considerable impact into the landscape, which will influences changes of microclimate, ecosystem and fresh-air quality. The evaluation of the fresh air quality in the remediated area of the Lake Most is one part of the complex project No. TA01020592 “Impacts of a hydrological open-cast mine reclamation on the microclimate, fresh-air quality, water and soil ecosystems” solved in the frame of the ALFA programme of the Technological Agency of the Czech Republic. The research is focused in the field of air quality on the assessment of the relevance of changes in air quality in the vicinity of the Lake, which occur as a result of changes of the microclimate in the area. The project monitors the long-term deposition of pollutants, which are characteristic for this industrial site -SO₂, NO_x, O₃, VOC, BTX, dust fallout and selected metals in dust fallout. The air sampling is carried out by passive technic. In addition to the listed pollutants, the concentration of aerosol particles PM₁₀ is continuously measured in the second zone and on the background reference site.

Keywords: hydrologic reclamation, Lake Most, fresh-air quality, dust fallout, PM₁₀

THE CLIMATIC CONDITIONS DURING SUMMER IN BULGARIA AND THEIR INFLUENCE ON COOLING DEGREE DAYS

Cvetan Dimitrov PhD

Assoc. Prof. Dr. Anelia Gocheva

Dessislava Denkova

Assis. Eng. Krastina Malcheva

National Institute of Meteorology and Hydrology, **Bulgaria**

ABSTRACT

Nowadays, the study of the discomfort period during the warm half-year became especially relevant for construction and healthcare. The discomfort periods become more and more prolonged, resulting in an increased use of air conditioners for maintaining of comfortable and healthy microclimate. It can be expected that in the next decade the energy consumption during the summer will be progressively escalating. Since Bulgaria is deficient in own energy resources, the optimal use of all available sources of energy taking into precisely account the climatic conditions is essential for optimization of design and maintenance of buildings.

The aim of this study is to analyze the influence of climatic conditions and their variations on the energy efficiency of buildings by means of an integrated characteristic – cooling degree days (*CDD*). The three largest and densely populated Bulgarian cities – Sofia, Plovdiv and Varna are explored, because of the large number of inhabitants and the significant energy consumption. The impact of contemporary climate conditions on the character of the summers in Bulgaria has been assessed using air temperature data, integrated characteristic of the discomfort period – cooling degree days (*CDD*) and other complex climatic parameters. Analysis of the seasonal course, interannual variability and trend in respect of air temperature, cooling degree days and some complex climatic parameters is made. The results for the last decade are compared with the normals for 30-year period (1981 – 2010). A comment for the character of the summer's discomfort period, its interconnection with climatic conditions and their variability for the cities, situated at different climate regions on the territory of the country, is presented.

Keywords: Applied Climatology, Climate Variations, Cooling Degree Days, Climatic Indices.

THE CONCEPT OF WIRELESS SENSOR NETWORK FOR EARLY WARNING IN THE CASE OF ACCIDENTAL RELEASES

M. Sc. Jan Suchanek^{1, 2}

Prof. Zdenek Zelinger¹

Dr. Vaclav Nevrlý^{2, 3}

Dr. Petr Bitala^{2, 3}

Dr. Martin Ferus¹

M. Sc. Michal Dostal^{1, 2}

M. Sc. Jakub Dlabka²

¹ J. Heyrovský Institute of Physical Chemistry, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

² VSB-Technical University of Ostrava, Faculty of Safety Engineering, **Czech Republic**

³ Institute of Thermomechanics, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

ABSTRACT

Recent development of promising instrumentation based on spectroscopic sensor technology and the concept of methodology for data handling and interpretation is presented by this work. Conventional experimental setup for tunable diode laser spectroscopy employing vertical cavity surface emitting laser (VCSEL) operating near 1300 nm was utilized for measurements in laboratory conditions. Characteristic spectral features of ammonia, hydrogen fluoride and methane were found in the tuning range of available VCSEL diode, implying feasibility of the given technique for construction of sensor nodes. Implementation of such units into the wireless sensor networks and early warning systems for risk areas and industrial sites is therefore presumed. This work summarizes some aspects concerning NIR-TDLAS measurement technique, sensor node construction and presents innovative concept of designing the sensor network, data handling and interpretation.

Keywords: gas detection, sensor network, laser diodes, dangerous chemicals, accident

THE CONCEPT OF WIRELESS SENSOR NETWORK FOR EARLY WARNING IN THE CASE OF ACCIDENTAL RELEASES

M. Sc. Jan Suchanek^{1, 2}

Prof. Zdenek Zelinger¹

Dr. Vaclav Nevrlý^{2, 3}

Dr. Petr Bitala^{2, 3}

Dr. Martin Ferus¹

M. Sc. Michal Dostal^{1, 2}

M. Sc. Jakub Dlabka²

¹ J. Heyrovský Institute of Physical Chemistry, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

² VSB-Technical University of Ostrava, Faculty of Safety Engineering, **Czech Republic**

³ Institute of Thermomechanics, v.v.i., Academy of Sciences of the Czech Republic, **Czech Republic**

ABSTRACT

Recent development of promising instrumentation based on spectroscopic sensor technology and the concept of methodology for data handling and interpretation is presented by this work. Conventional experimental setup for tunable diode laser spectroscopy employing vertical cavity surface emitting laser (VCSEL) operating near 1300 nm was utilized for measurements in laboratory conditions. Characteristic spectral features of ammonia, hydrogen fluoride and methane were found in the tuning range of available VCSEL diode, implying feasibility of the given technique for construction of sensor nodes. Implementation of such units into the wireless sensor networks and early warning systems for risk areas and industrial sites is therefore presumed. This work summarizes some aspects concerning NIR-TDLAS measurement technique, sensor node construction and presents innovative concept of designing the sensor network, data handling and interpretation.

Keywords: gas detection, sensor network, laser diodes, dangerous chemicals, accident

THE INFLUENCE OF MINING ACTIVITIES IN THE AIR QUALITY AND STRATEGIES FOR ITS IMPROVEMENT: THE TAIYUAN (CHINA) CASE STUDY

Zhou Qinglong^{1,2}; Herbert, Juan Herrera²; Gomez, Jorge Castilla²

¹ Institute of Mining Technology, Taiyuan University of Technology, **China**.

² Department of Mining and Underground Excavations. Madrid School of Mines. Technical University of Madrid (UPM), Madrid, **Spain**.

ABSTRACT

In 1998, a list of the ten most polluted cities was released by the World Health Organization (WHO). Taiyuan, one of the Chinese industrial, energetic and chemical industry hubs, ranks foremost among these cities. In January 2012, the Asian Development Bank (ADB), the World Resources Institute (WRI) and the Tsinghua University (THU) jointly issued the “Toward an Environmentally Sustainable Future - Country Environmental Analysis of the People’s Republic of China (PRC)”, which showed that less than 1% of the 500 largest cities in the PRC meet the air quality standards recommended by the WHO, and 7 cities in the PRC are ranked among the 10 most polluted cities in the world. Once again, Taiyuan in the Shanxi Province was ranked first.

Based on the case of the industrial city of Taiyuan in Shanxi province, this paper shows how this problem is studied and the methodology developed to bring solutions to improve the reduction in air pollution maintaining the city as one of the most economic and industrial centers in China. For this, the paper firstly makes a detailed description of its air contamination in recent years and then analyses those polluting factors, including the old and irrational industrial layout, special geographical location, meteorological condition of Taiyuan and the intensive mining operations of surrounding areas. With these combined effects of various factors, the paper discusses how to effectively improve its pollution situation.

Keyword: Air quality, Industrial city, Taiyuan, Environment, Mining activities.

THE INFLUENCE OF THE ASPHALT MIXTURE COMPOSITION ON THE PAVEMENT SURFACE TEXTURE AND NOISE EMISSIONS PRODUCTION

Assoc. Prof. Dr. Eva Remisova

Prof. Dr. Martin Decky

Assoc. Prof. Dr. Matus Kovac

University of Zilina, Faculty of Civil Engineering, **Slovak Republic**

ABSTRACT

The article deals with properties of three different the most common used asphalt mixtures, for pavement wearing course in term of noise pollution. The noise emissions production is influenced (except for the tires, type and speed of vehicle) particularly by pavement surface texture. The texture depends on asphalt mixture composition, especially aggregate particle size distribution, maximum nominal aggregate size and content and type of bitumen binder.

The article presents results of research activities of authors dealing with three different asphalt mixtures – stone mastic asphalt (SMA), asphalt concrete (AC) and porous asphalt (PA). The texture characteristics of the listed asphalt mixtures were measured and evaluated by means of 3D scanner with high resolution. There were also evaluated physico mechanical characteristics of the asphalt mixtures, and noise pollutions measurements on selected road sections were performed as well.

Keywords: asphalt mixtures, asphalt pavement, surface texture, noise emissions, 3D scanner

**THE INFLUENCE OF THE LOCAL CLIMATE CHANGES ON THE AIR
QUALITY IN THE AREA OF THE HYDRIC RECLAMATION - THE LAKE
MOST**

Ing. Jan Brejcha

Ing. Milena Vágnerová

Výzkumný ústav pro hnědé uhlí a.s., **Czech Republic**

ABSTRACT

Brown coal open pit mines in the North Bohemia region are slowly approaching their boarders and they are going step by step to the end of their operation. Planned and even already realized reclamation procedure in the region is based on the formation of artificial lakes. The nature of the surface cover in the studied area has changed from mining landscapes without vegetation to the water area with “green” surroundings after the hydrological reclamation of the residual pit of the quarry Most – Ležáky. The local climate is significantly influenced within the warm part of the year, when the temperature of the water in the Lake is higher than the air temperature. The period of daily temporarily degraded local dispersion conditions is extended under certain meteorological conditions and thus the time for the possible dilution of cumulated pollutants is shorter. The evaluation of the fresh air pollution development in the foothills of the “Krušné hory” Mountain during the gradual filling of the Lake in the years 2008 to 2013 proved an anomalous increase in the number of the day with the exceeded limit of the 24-hour average of the PM₁₀ concentration of aerosol particles on the stations in the vicinity of Lake Most in the comparison with the other stations in the region. This situation was typical for the spring and summer months of the years 2010 to 2013. The similar phenomenon was not detected within the years 2008 and 2009, when only a small part of the Lake was filled. The subject of the current research is the classification of the real dispersion conditions in the context with the meteorological situation in the area and the selection of such situations in which a significant influence on the local air pollution can be expected thanks to the microclimate change. The model evaluation will be done for such selected situations to evaluate their spatial extent and the significance of this influence.

Keywords: hydric reclamation, Most Lake, air quality PM₁₀, local climatic effect

WARM MIX ASPHALT – ENVIRONMENT FRIENDLY PAVEMENT TECHNOLOGIES

Lecturer Dr. Eng. Adrian Burlacu¹

Assoc. Prof. Dr. Eng. Carmen Răcănel¹

¹ Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

The destruction of natural resources and climate change are the main causes of damage and disruption of ecosystems. Industry, agriculture, and transport are blamed for being the main contributors. This awareness was formalized in 1997 by the Kyoto Protocol to the United Nations Framework Convention on Climate Change which featured, in particular, a commitment made by signatory states to bring greenhouse gas emission rates down to 1990 levels. This agreement came into force on February 13, 2005. Warm-mix asphalt technology addresses this issue in a rather small but important way. The concept of warm-mix asphalt has been introduced over the last few years, a mixture produced at temperatures in the range of 20°C to 40° C lower than typical hot-mix asphalt (HMA). Technologies that allow lower HMA production temperatures may demonstrate positive impacts on pavement performance and in reduction of pollutant emissions. The results are presented like comparative graphs and the conclusions will establish which is the performance of WMA.

Keywords: roads infrastructure, warm mix asphalt, CO2 reduction, bitumen additives, mixture stiffness

ZONING OF THE TERRITORY OF IRKUTSK (RUSSIA) BASED ON INTEGRATED ASSESSMENT OF AIR POLLUTION

Assoc. Prof. Dr. Saiana Vologzhina
Assoc. Prof. Dr. Ekaterina Sutyryna
PhD student Anastasiia Akhtimankina

Irkutsk State University, **Russia**

ABSTRACT

The article is devoted to the study of pollutant distribution in the atmosphere of Irkutsk. These pollutants enter the air basin from industrial enterprises and vehicles. Irkutsk is a big industrial centre of Siberian federal district of Russian Federation. On the grounds of the city there are approximately 250 industrial enterprises with more than 3 000 stationary air pollution sources carried as an asset and more than 200 000 vehicles.

Air pollution was estimated by the multivariate statistical analysis and the numerically simulated model based on analytic calculations of differential equation of travel and eddy mixing extraneous substances. Inventory data for indicators of emitters, vehicle data and remote sensing data together with long-standing data of wind velocity and air temperature daily weather observations with 8-prefix of time were applied as the input information. Special attention has been paid to climatic features of the area, as the city is located in an area with low self-purification potential of the atmosphere.

By results of research the authors carried out zoning of the city, identified the areas with the highest level of pollution based on distribution of emissions from stationary and mobile sources and analysis of the accumulation of pollutants in the snow cover.

Keywords: remote sensing, modeling, industry, vehicle, snow cover