

**A DISTRIBUTED MODEL OF SNOWMELT PROCESSES (ON EXAMPLE OF
VOTKINSKOE RESERVOIR CATCHMENT AREA)**

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ABSTRACT

The article analyzes the methods and results of distributed modeling of snowmelt processes on the Votkinskoe reservoir catchment area. The model is based on GIS technologies. For evaluation of the snowmelt intensity, the authors have used the empirical method of calculation of snow cover energy balance, was proposed by P.P. Kuzmin. The validation of simulation results is made according to snow survey data and remote sensing data.

Keywords: snow cover, snowmelt, snow water equivalent, GIS-based modeling, remote sensing data

A FIELD STUDY ON OVERNIGHT STAGNATION OF DRINKING WATER IN DOMESTIC DISTRIBUTION SYSTEM

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ABSTRACT

The present study investigates the influence of in-house installation systems to the tap water quality. In the study were collected more than 100 tap water samples from one important city situated in South-East part of Romania with approximately 250,000 inhabitants in order to get an overview of the current contamination level of drinking water (chemical and microbiological) at the consumer's tap.

The quality of drinking water provided by the Water Company was situated in the limits imposed by the National Legislation. The metal concentrations recorded in tap water samples collected with tap flushing procedure were situated under the maximum admissible values, in all cases. The data obtained for 41% of first draw samples (samples collected first in the morning from kitchen without previous flush of the tap) indicated a pollution of drinking water with some metals (Cu, Fe, Ni and Pb) as result of domestic equipment types (pipe, tap, fitting). High concentrations of Cu, Fe and Pb were recorded in households where most of the material used in domestic distribution system was either copper, either cast iron or lead. The study results indicate that in summer period, under the influence of high temperature, the mesophilic bacteria could exceed the admissible values. Biological results showed that in about 55% of the first draw samples, the number of bacteria (at 22°C and 37°C) exceeded the admissible limits, but flushing the tap for more than five minutes lead to improve water quality. Only 14% of the samples remain non-compliance samples.

The conclusion of the study indicates that materials used and stagnation of the water in domestic distribution systems affect the drinking water quality at the consumer's tap.

Keywords: drinking water, stagnation, metals, microbial growth

A WAVELET APPROACH FOR DETECTION AND LOCATION OF LEAKS IN WATER DISTRIBUTION NETWORKS

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ABSTRACT

Leak detection of water distribution networks is a problem that arouses the responsible authorities for distribution all around the world. The reason, which involved researchers representing various disciplines to try to find a solution to the problem by implementing efficient devices in this field. Distribution networks are being degraded over time, which can cause leakage. To detect a leak equipment and techniques are needed. They are constant progress with the development of technology. In this paper, the CWT (continuous wavelet transform) was suggested as a technique for detecting and locating leaks in water distribution networks. The treatment using the CWT technique was found as the best solution for confirmation of the presence of a leak after trying different signal analysis tools such as transforms (FFT, STFT, etc ...). The application was carried out in the laboratory with a short channel hybrid prototype (a part of steel followed by a part in PVC). Validation tests have shown the effectiveness of the method.

Keywords: Leak detection, CWT, FFT, Localization, distribution networks.

ADVANCE HYDRAULIC MODELING USING MIKE 11, BARAOLT RIVER, ROMANIA

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ABSTRACT

To exemplify of flood risk map achievement with MIKE 11 hydroinformatic tools was considered a sector of Baraolt River, located in center Romania. Considered sector have a length of 4,9 km, representative 36 cross sections are considered in the right of localities Baraolt and in river Baraolt. Cross sections have been raised by the Romanian Water Basin Administration. The input data are: area plan with location of cross sections; cross sections topographical data and roughness of river bed; flood discharge hydrograph in section Baraolt. After simulation with MIKE 11 result the water level in each cross sections. Based on contour maps we can establish the flooded area, the flood risk map for the maximum discharge.

Keywords: management, flood, flood risk management plan, hydroinformatic tools

**ANALYSIS OF CONCENTRATIONS HEAVY METALS (Zn, Pb, Cu, Cd)
IN SPOIL TIP LEACHATE FROM COAL MINING**

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ABSTRACT

Industrial waste landfills are the source of pollution of the surface water and groundwater. Water pollution is mainly a consequence of highly mineralised leachate. In addition to the high concentration of the main ions leaching water may contain high concentrations of other substances, including heavy metals. This article analyses the presence of heavy metals in coal mining landfill leachate. For the study the objects located in the Upper Silesian Coal Basin were selected. As control objects natural springs flowing from the Carboniferous rock were chosen. It was shown that the leachate water has high electrolytic conductivity (up to 17 mS/cm^{-1}) and neutral or slightly acidic pH. The concentration of heavy metals in the leachate is not large. There were no statistically significant differences between the heavy metals concentration in the leachate and spring water. Moreover, there were no statistically significant correlations between the pH and the concentration of heavy metals. Neutral or slightly acidic pH of the leachate is not conducive to leaching metals from waste. It should be recognised that mining landfills are not major sources of heavy metals pollution of the hydrosphere.

Keywords: heavy metals, leachate, rubbish dumps, water pollution

**ANALYSIS OF PARCOVACI AND CIURBESTI (IASI COUNTY, ROMANIA)
RESERVOIRS SEDIMENTATION**

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ABSTRACT

Reservoir silting is a process of concern because of its implication on hydrologic management and sediment budget analysis. We have applied a classic methodology of subtracting initial and actual surveyed topography of reservoir bed in a GIS environment to assess the extent of the silting process for two reservoirs situated in the central part of the Moldavian Plateau (Eastern Romania), in Bahlui River Basin: Parcovaci reservoir and Ciurbesti reservoir. While both reservoirs have similar dimensions (discharge, catchment area, volume), the catchment physiographic conditions differ. Since the construction, both reservoirs have their gross volume half filled, although Ciurbesti reservoir it is twice older than Parcovaci, in the second reservoir catchment the volume of produced sediment being double than the first one. The sediment distribution reflect the shape of the reservoir bathymetry and the laws of sedimentation, with clear deltas and dam high sediment thickness. The sedimentation results is consistent with the trends cited in the literature for Moldavian Plateau.

Keywords: reservoir sedimentation, bathymetric survey, DEM of difference

ANALYSIS OF SURFACE AND GROUND WATER INTERACTION IN THE DANUBE RIVER BRANCH SYSTEM

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ABSTRACT

Interaction of surface and groundwater in left hand-side floodplain area of the Danube River, surrounded by upper power canal and the Danube River was assessed. Two scenarios have been considered for computational analysis. The first scenario is the current state, where dominant influence on the groundwater regime is given by discharge and water level regime in the branch system. Branch system is fed by inlet structure in Dobrohošť. The second scenario provided in the contribution is a forecast of groundwater regime after a possible construction of planned underwater weirs in the Danube River. Results of numerical modelling solving steady non-linear Boussinesque equation by the finite element method have shown that the groundwater regime in the floodplain area would be improved and the drainage effect of the Danube River reduced or completely neglected.

Keywords: groundwater flow, finite element method, hydrologic regime, Danube river branch system, floodplain.

ANTIMONY ELIMINATION FROM MINE WATER BY SELECTED REMEDIATION TECHNIQUES

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ABSTRACT

During the experimental testing of antimony elimination from mine water collected at the Sb deposit Poproč (Slovakia) three remediation techniques were used: absorption on activated carbon; ion exchange resin technique (use of single strongly acidic cation-exchanger - catex Amberlite IR 120 and use of combination of strongly acidic catex and weakly basic anion-exchanger - annex Purolite A-100) and absorption on commercial sorbent GEH (granulated $\text{Fe}(\text{OH})_3$ with content of βFeOOH and H_2O). Characteristic for the tested mine water was the pH value 7.3 and content $120 \mu\text{g.l}^{-1}$ of Sb that is 24 times higher concentration than the limit of Sb content in drinking water ($5 \mu\text{g.l}^{-1}$) ordered by Decree no. 252/2004 Coll. (CZ) and the SR Government Regulation No. 354/2006 Coll. (SK).

The results of the column experiments confirmed low ability (20 %) of activated carbon in the process of Sb elimination. Furthermore, use of single strongly acidic catex reflected relatively low (41 %) efficiency in elimination of Sb from tested mine water. On the other hand, combination of strongly acidic catex and weakly basic annex has confirmed the assumed high efficiency of Sb elimination (98 %). Use of sorbent GEH also resulted in high ability of Sb elimination from mine water (98 %). The pH values of tested water were not significantly changed after using all of the remediation techniques. Ion exchange resins (combination of catex and annex) and absorption on sorbent GEH have proved very good ability in the case of elimination of Sb from mine water.

Keywords: antimony, mine water, activated carbon, ion exchange resin, GEH

**APPLICATION OF A HYDRODYNAMIC MIKE 11 MODEL
FOR ARGESSEL RIVER**

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ABSTRACT

This paper presents a 1-dimensional unsteady flow hydraulic model used for the simulation of flow in rivers: the MIKE 11 model from the Danish Hydraulic Institute (DHI). In this study, the hydraulic model uses flow and stage hydrographs in a time series format from field measurements. The approach for this model leads to unsteady flow simulations along stream channel reach. The study case applied to the model is the Argesel River in Romania. MIKE 11 – UHM (Unit Hydrograph) was used for the simulation of rainfall runoff process in the Argesel River catchment and MIKE 11 – HD was used to simulate the unsteady flow of the Argesel River. The study's focus was the development of a MIKE 11 model based on surveyed, stream cross-section data. The results of this study explain that the model gives a good simulation of the flow according to a comparison between the estimated and observed stage hydrograph.

Keywords: MIKE 11, unsteady flow, 1-dimensional flow, rivers modelling, UHM, SCS method.

ASPECTS PREVENTING THE RESTORATION OF EXTINCT PONDS

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ABSTRACT

This paper focuses on the restoration of extinct ponds. The number of extinct ponds in the Czech Republic is very high as many ponds ceased to exist since the Golden Age of fish farming which is dated to 15th century. The restoration of such ponds is considered as one of possible ways to increasing landscape retention capacity which is supposed to be a part of measures for mitigation of considered climate change impacts. These are expected to result in more frequent floods having higher magnitudes and on the other hand in longer and more frequent periods of droughts.

The restoration of extinct ponds can be advantageous mainly with respect to the possible use of dam residues for building new reservoir which can save a lot of financial resources. Another reason for consideration of extinct pond areas for given purpose is the suitability of their profiles as these were mostly carefully selected in past. However, there are also aspects which make the restoration impossible or inappropriate. These are besides others the urbanization and nature protection or environmental issues.

This paper focuses on the assessment of above mentioned aspects which can be a reason for which the restoration is not possible. The results show, that from the point of view of frequency the urbanization is more important aspect than the environmental issues. However, there are still many extinct pond areas which could be restored into water bodies even after exclusion of those which cannot be restored due to urbanization or environmental issues.

Keywords: extinct pond, pond restoration, urbanization, environmental protection

ASSESSMENT OF SILTING UP AND TREND OF WATER QUALITY IN CHOTÁRNY CHANNEL

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ABSTRACT

The article presents the current situation of silting up in one of three main channels of the Žitný ostrov channel network at Southern Slovakia – in the Chotárny channel. This channel network was built up for drainage and irrigation. From the view of mutual interaction between channel network and groundwater it has been necessary to judge the impact of channel network silting up by alluvials on this interaction. The rate of cross-section profiles aggradation along this channel was evaluated from the field measurements in 2012. The Žitný ostrov area is one of the most productive agricultural areas of Slovakia because of its favourable climate, soil and morphological conditions. For this reason there exist also several requirements to the quality of water in the channel. The course of quality in this channel was evaluated statistically from accessible data of Slovak Hydrometeorological Institute database (SHI). The indicators of water quality were monitored in one monitored profile at Chotárny channel in rkm 10,0 - Jánošíkovo na Ostrove during period 1991 – 2006 (with focus to the same season as the field measurements in 2012 were performed). Unfortunately, longer range of data was not available. There was evaluated the trend of water temperature, pH values, conductivity and concentration of suspended solids and total dissolved solids (TDS). The results are presented by graph forms. The grade of aggradation along the Chotárny channel during measured period ranges from 13,30 – 55,52 % of discharge area. The values of pH in rkm 10,0 during period of 1991 – 2006 run the values 7,2 - 8,3 and show explicitly decreased trend, the course of temperature during this period was balanced, oscillating between 15,95°C and 24,10°C. The course of conductivity during evaluated period is evidently fluctuated, from minimum 34,25 mS.m⁻¹ to maximum 54,5 mS.m⁻¹. The average value of this indicator was 43,10 mS.m⁻¹, standard deviation of time series was 5,44 mS.m⁻¹. The course of suspended solids concentration had similar character as conductivity, with minimum 232 mg.l⁻¹ and maximum 412 mg.l⁻¹. The average value of this indicator was 296,27 mg.l⁻¹ with standard deviation 45,28 mg.l⁻¹. The course of TDS had descended trend, with minimum 2 mg.l⁻¹ and maximum 30 mg.l⁻¹.

Keywords: silting up, channel network, water quality, interaction of surface and groundwater, Chotárny channel

**ASSESSMENT OF THE POTENTIAL IMPACT OF CLIMATE CHANGE
UPON SURFACE WATER RESOURCES IN THE IALOMITA RIVER BASIN
FROM ROMANIA**

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ABSTRACT

The warming of the global climate caused by the greenhouse effect can induce essential changes in the hydrological regime and water resources at a different time and space scale.

Water balance modelling with regard to climate change scenarios can give substantial information on changes in the hydrological situation in the future. Water-balance models are especially useful for identifying the regional hydrologic consequences of changes in temperature, precipitation, and other climatic variables [1].

The aim of the present research is the determination of the impact of possible climatic changes in the 21st century upon surface water resources in the Ialomița river basins, using the WatBal (water balance) model.

The analyzed river basin covers an area of 10 309 km² and is located outside the curvature of the Carpathian Mountains, in an area where the altitude varies between 50 m and 2500 m. In accordance with the altitude, the annual precipitation varies from 450 mm/year in the plain area to over 1000 mm/year in the mountain area and the evaporation-transpiration between 850 mm/year in the plain area to 500 mm/year in the high areas. On the other hand, due to a very high variability of weather conditions, droughts, as well as excessive humidity periods, may occur during the year.

WatBal is an integrated water balance model developed for assessing the impact of climate changes on a river basin runoff. This model has essentially two main modelling components. The first is the water balance component that uses continuous functions to describe water movement into and out of a conceptualized basin. The second component is the computation of the potential evaporation-transpiration processes. The model input components are: precipitation, air temperature, relative air humidity, wind speed, sunshine duration, net radiation, albedo and historic discharges (only for calibration of model parameters). The output components are: effective precipitation, potential evaporation-transpiration, total modelled runoff (direct, surface, subsurface runoff and base flow) and relative depth of water reserves in the basin [2].

Monthly data series recorded at 8 weather stations and 1 runoff gauging-station during the 1961-2007 period have been used for the calibration of the WatBal model to the local conditions of the area.

Finally, the paper focuses on the values of the mean monthly discharges at Țândărei gauging station on the Ialomița River, estimated in the above-mentioned hypotheses. The paper analyses the influence of potential climatic changes, expressed by a wide range of climatic scenarios, upon the average water resources in the Ialomița river basin.

We have also taken into consideration the average-low water resources, expressed by the minimum monthly average liquid discharges and characteristic to low-water periods as well as the average-maximum water resources, expressed by the maximum monthly average liquid discharges and characteristic to high-water periods.

Keywords: Ialomița River Basin, climate changes, WatBal model, surface water resources

ASSESSMENT OF THE QUALITY OF AN AQUATIC HABITAT FOR SCHNEIDER IN NITRICA RIVER

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ABSTRACT

The article is focused on the process of evaluation of the quality of aquatic habitats. The habitat quality is characterized by bioindication, which is represented by ichthyofauna in habitat suitability curves. During the periods of minimum flows the ichthyofauna prefers covers with deeper habitats. This has been showed by the correlation of suitability curve characteristics for water depth. The curves are based on the frequency sorting of the fish in microhabitat, which were determined on the basis of the ichthyological survey. Accuracy assessment of the suitability curves is one of the most important steps in the IFIM methodology. Evaluation and generalization of the suitability curves for Schneider (*Alburnoides bipunctatus*) was done in Nitrica river. Evaluation of the suitability curves was verified on the eastern Slovakia rivers Bebrava, Chotina and Nitrica. The suitability curves were processed for two abiotic parameters - depth and velocity.

Hydraulic and ichthyologic measurements were performed in summer 2013. The morphology of the Nitrica River was measured for needs of 2D hydraulic modeling, which was performed by 2D model DHI MIKE 21FM. The model was set up for 280 m-day discharge of the Nitrica River. Results from the hydraulic model were used for final analysis. The final analysis was provided in GIS environment by ArcGis 10.1. The results of weighted usable area show that the Schneider prefers minimum range of flows.

Keywords: IFIM, 2D hydraulic model, Weighted Usable Area (WUA), suitability curve, Schneider

**CALCULATION OF WATER FOOTPRINT CONSUMPTION FOR
DETERMINING IMPACT ON WATER RESOURCES**

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ABSTRACT

The water footprint consumption of Bashkortostan Republic (Russian Federation) for 2012 year and the Russian Federation as a whole was calculated in this paper. The calculated water footprint consumption values for 2012 year have been compared with the calculated water footprint consumption values for the period 1996-2005 years. The impact of blue and gray water footprint components on water resources has been defined. The quantitative values of the load on water resources were defined. The results of research can be used for water resources management as an indicator of water use related to consumption.

Keywords: water footprint, consumption, water resources, water use

CHALLENGES IN THE HYDROLOGICAL INDICES IMPLEMENTATION IN THE PROCESS OF DROUGHT IDENTIFICATION AND MONITORING

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ABSTRACT

Drought as a natural phenomenon has one very important feature – still it is not possible to influence on its appearance and scale. But the good thing is that it is characterized by different aspects and we could influence on some of them. Water resources management gives such a possibility by planning and taking appropriate measures to react. Different approaches are applicable if we have information about the severity and when and where we could expect the event. And hydrological indices are one of the appropriate solutions.

In help of experts and decision makers in the field this article is addressed to share Bulgarian experience in implementation of hydrological indices for Drought identification. There briefly are presented main tasks of their application and challenges concerning process. For illustration an Automatic Monitoring System for Drought Identification developed by NIMH-BAS on National level by the index SRI is presented.

Keywords: drought, drought monitoring, drought management, SRI, hydrological drought indices

CHEMICAL PARAMETERS OF WELL WATERS IN AN AREA AFFECTED BY FLOOD EVENTS: CASE STUDY OF TIMIS-BEGA AREA, ROMANIA

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ABSTRACT

Determination of chemical parameters in drinking waters is essential in the assessment of human health effects. The present study evaluates the chemical parameters (inorganic anions and metals) of twenty well-waters used as drinking water supply, in a rural area affected by several flood events from Timis-Bega area, Romania. In all analysed well water samples, the concentrations of fluorides and chlorides were below the maximum allowable concentrations (MAC) for drinking water established by European environmental legislation (Drinking water Directive 98/83/CE), nitrites and sulphates concentrations exceeded MAC in one sample, nitrates exceeded MAC in three samples. Phosphates concentrations exceeded threshold values for drinking water in the majority of the samples. Among the studied metals, Mn exceeded MAC in over 50% of the samples, Fe slightly exceeded MAC in only one sample, while Na, Cd, Cr, Cu, Ni and Zn concentrations did not exceeded the corresponding MACs. Despite the fact that several contaminants were below the corresponding thresholds, the high concentrations of Mn and phosphates may pose a risk to human health if the wells are used as drinking water source.

COMPARATIVE STUDY OF DIFFERENT DRINKING WATER TREATMENT TECHNOLOGIES USING LIFE CYCLE ASSESSMENT METHOD

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ABSTRACT

The aim of the study is to choose the variant of design optimization of existing drinking water treatment plant by Life Cycle Assessment (LCA) tool. This plant is located in the Chelyabinsk region of Russian Federation. In this LCA we compared two water treatment technologies: conventional system and ultrafiltration (UF) with ozonation – activated carbon pretreatment. The software Sima Pro 8.0.2 has been used as the LCA analysis tool. Eco-Indicator 99 method has been applied. The results show that the UF is characterized by the high consumption of electricity. In conventional technology the electricity consumption is seen as efficient, but its chemical usage is seen as the major contributor to the reduction of environmental quality and human health.

Keywords: Life Cycle Assessment (LCA), water treatment plant, drinking water, conventional water treatment, ultrafiltration (UF)

COMPARISON OF MODIFIED ZEOLITES FROM DIFFERENT DEPOSITS IN GROUND WATER TREATMENT

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ABSTRACT

There are presented results of technological experiments carried out in Water Treatment Plant Kúty. The goal of this study was to compare modified zeolite known as clinoptilolite (rich deposits of clinoptilolite were found in the region of East Slovakia in the 1980s) with the imported modified zeolite from deposit situated in Hungary. Klinopur-Mn and Klinomangan were used for removal of iron and manganese from ground water to meet the requirements of the Regulation of the Government of the Slovak Republic No. 496/2010 on Drinking Water. The materials observed exhibit different efficiencies of manganese removal from water, since the quality of the treated water play a major role (oxygen content and pH value). In the case of the removal of the iron from the water, the quality of the raw water is not a limiting factor; both materials removed Fe from the water to below the limit value (0.20 mg.l^{-1}).

Keywords: treatment of ground water, removal of iron and manganese, modified clinoptilolite, Klinopur Mn, Klinomangan

COMPARISON OF PROFILE VELOCITY DETERMINATION BY ADV MEASUREMENT AND BY TRACER EXPERIMENTS

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ABSTRACT

One of the basic information about hydrodynamics of a stream is its velocity profile. The paper deals with the average profile velocity determination in a stream by two different methods: ADV (Acoustic Doppler Velocimeter – FlowTracker) and tracer experiments (indicator method).

The ADV - FlowTracker (SONTEK Company) measures the stream flow velocity by 2D or 3D probe and it is based on application of Doppler principle. Tracer experiments (indicator method) for determination of velocity is one of the alternatives of hydrologic methods.

Field measurements were performed on the Malá Nitra stream, in the part of Veľký Kýr village (N+48° 10' 50.02", E+18° 9' 19.60"). Solution of sodium chloride was used as a tracer. Average profile velocity was determined in four profiles, in a straight and a curved reach of the Malá Nitra stream. The velocity was measured by both methods in the each cross-section profile. The profiles were established in various distances (first profile – 60 meters; second profile – 180 meters; third profile – 410 meters; fourth profile – 730 meters). The first and second profile was located in a straight part of the stream, the third and fourth profile was located in a curved part of the stream. In particular experiments the tracer was applied into different location along width of the stream: in the middle, on the left bank and on the right bank.

The results indicated that the differences between velocities determined by ADV and indicator method increase with growing distance. In the case of indicator method the accuracy of velocity assessment depends on localisation of tracer along width of the stream. In spite of that, measurement results assessment shows that indicator method is not influenced by tracer localisation on the right or on the left bank.

Keywords: Acoustic Doppler Velocimeter, average profile velocity, indicator method, tracer experiment

**COMPARISON OF THE NITRATE CONCENTRATION CHANGES IN
RELATION TO THE DIFFERENT FORMATION OF FLOOD CURVES ON
THE GRASSY CATCHMENT DURING RAINFALL-RUNOFF**

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ABSTRACT

The quality of natural inland waters is related to geomorphology, climate and land-use in the catchment. The size and slope of the catchment, precipitation, wind, temperature, erosion, vegetation and soil structure – these all play a role in the catchment water quality. The study is aimed at describing differences in nitrate concentration changes during the rainfall-runoff events in relation to different types of these events and also to different shaping of the hydrograph. The relationship between concentrations and runoffs are explained by the c-q (concentration-discharge) loops. The study also expects that different types of rainfall-runoff events in connection with their origin will produce different behavior of the nitrate concentrations. The higher outflows resulting from convective storms predict the higher concentrations but correlation with water discharge is low. In contrast frontal storms runoff caused lower concentration but the correlation with water discharge is better.

Keywords: flood, nitrate, grass, hydrograph

COMPARISON OF DEMAND DRIVEN AND PRESSURE DRIVEN HYDRAULIC ANALYSIS OF THE IRRIGATION NETWORK

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ABSTRACT

Assessments of irrigation water distribution networks can be approached with two different ways. First approach represents demand-driven analysis, where on the first place lies nodal demand regardless from actual pressure. The other way represents pressure driven analysis which recognizes the relation between nodal heads and nodal flows. This approach is also applicable in scenarios, where the demand is fully dependent on pressure like irrigation sprinkler system. Almost all the traditional network hydraulic models are built upon demand-driven approach. Therefore, it is very desirable that reliability analysis techniques based on interpretations or transformations of demand-driven results from a pressure driven perspective be evaluated. Both of these two approaches were applied on older irrigation network in southern part of Slovakia. Various demand condition were created by an algorithm in the meaning of demand nodes placement. The purpose of this paper is to explore possibility and limits of these two approaches to water distribution network analysis.

Keywords: Irrigation networks, simulation model, demand driven analysis, pressure driven analysis, Epanet

**COMPREHENSIVE ECOLOGICAL ASSESSMENT OF WATER RESERVOIR
AND THE REASONING OF ECOLOGICAL ZONING OF WATER-BODY**

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ABSTRACT

The analysis of the data of monitoring of natural waters (15 indicators) and sediments (8 indicators) reservoir of the river Oredezh (Leningrad region, Russia) was made for the period 2008-2011. Variations of the content of Mn, Fe and P in the bottom sediments were investigated in spatial-temporal aspects. The coefficients and indexes manganese pollution of bottom sediments were calculated. In result the method of environmental zonation for water-body was proposed. Ecological stability according to the obtained data were estimated, zones of ecological risk were revealed.

Keywords: ecological assessment, quality of water, sediments.

CONCENTRATION OF HEAVY METALS IN THE SITNICA RIVER

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ABSTRACT

Industrial discharges, urban and agricultural affecting the deterioration of water quality in the Sitnica River, which flows in the village Sazli, municipality of Ferizaj and has a length of 90 km.

The exact concentrations of heavy metals enable a realistic assessment of the degree of pollution of a natural ecosystem water and wastewater. The purpose of this study is to the concentration of heavy metals in water of Sitnica River. Water samples were taken at 10 monitoring stations upstream and downstream of the discharge of waste water streams that flow into the river. While their analysis and determination of the concentration of heavy metals was done by Hydro-meteorological Institute Kosovo with Spectrophotometer.

Experimental results show that the quality of water in the Sitnica River is risked by heavy metals in the secondary and down stream flow due to water flowing from the Power Plant Kosovo "B ". In general, the concentration of heavy metals in some monitoring stations exceeded the maximum allowed values. Therefore recommended initial treatment of discharged water and periodic monitoring of heavy metals in the water of Sitnica River.

Keywords: Heavy metals, Water quality, Concentration, pollution The Sitnica River.

CONFRONTATION OF THE RESEARCH ON THE DOBROHOŠŤ SHPP AND ITS OPERATION AFTER ITS CONSTRUCTION

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ABSTRACT

The paper describes the research on the Dobrohošť small hydropower plant (put into operation in 2011) that was performed by the Department of Hydraulic Engineering and the experience of its operation.

This research preceded the construction of this small hydropower plant and its main objectives were focused on the verification of the design of the hydropower plant by simulating normal operation scenarios at steady flow conditions as well as emergency and failure simulations at unsteady flow conditions. The steady flow simulations were aimed to verify velocity fields at the floating barrage of the intake structure, hydraulic losses at the entire water intake (intake structure, pressure conduit and surge chamber). The unsteady flow simulations were aimed to verify the surge chamber capacity and the water hammer effects in the pressure conduit and the surge chamber.

The research consisted of field measurements at the Dobrohošť intake structure, physical research on a scale model in the hydraulic laboratory and mathematical modelling of selected problems of the intake structure.

The results of this hydraulic research and the experience from the operation after the construction of this hydropower plant are confronted. The confrontation shows problems with the intake structure design determined by the research in real operation of the small hydropower plant due to the neglecting of the research results.

Keywords: hydraulic research, physical modelling, mathematical modelling, small hydropower plant, operational experience

DECISION SUPPORT FOR MANURE MANAGEMENT AT FARM AND COMMUNA LEVEL

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ABSTRACT

This paper was accomplished in the framework of **LIFE09 ENV/RO/000612 - CLEANWATER** project, co-financed by the European Community Commission, having as main objective the accomplishment at Barlad basin level, of a decision support for the involvement of farmers in sustainable manure management in order to make them sensitive to the issues related to the nitrates pollution within the basin, having as consequence the decrease of potable water source.

The Barlad River basin (area of 7220 km², mean altitude 211 m) is situated in the south-east part of the Romania country and has more than 37% of the total surface designated as vulnerable zone to nitrate pollution due to a great number of agricultural sources.

Manure can be a serious problem when it is not managed correctly. Competent management of manure involves planning, defining the problem and the actions being undertaken to solve the problem.

The aim of this work was to present the computer-aided-Decision-Support for Manure Management (DSMM) at farm and "comuna" level, created in the framework of the project CLEANWATER, in order to encourage the farmers for participate in the manure management, focusing on the information about the spread of manure on the arable land and the application of a good manure management within the farms. The Decision Support is an important tool for farmers, its structure allowing each farmer to evaluate the characteristics of the farm, to define precisely the situation that is found, what actions needs to do in order to improve the work and therefore would be prioritized in decision making.

Keywords: good manure management, nitrates directive, involvement of farmers, vulnerable zone, nitrate pollution

DECISION SUPPORT TOOLS FOR WATER QUALITY MANAGEMENT

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ABSTRACT

This paper presents two powerful tools for decision support systems that could help to mitigate accidental pollution effects: a Mike 11 Advection Dispersion model and an ArcGIS Online web application. Modeling of the water quality was done on a stretch of approximately 30 kilometers, downstream Glina, Bucharest's waste water treatment plant situated on Dambovita river up to the junction with Arges river. The waste water from over 2 million inhabitants of the capital is treated only at Glina WWTP. In case of a breakdown a serious pollution may occur affecting the ecological system on Dambovita river, downstream Bucharest, leading also to the closure of some settlements water intakes. In this perspective four model scenarios were created to determine what are the concentrations of different constituents along the river stretch and the propagation time in the following cases: **a.** Glina WWTP breakdown during dry operation period; **b.** during torrential rains when waste water discharges bypass Glina WWTP due to its limited capacity; **c.** "case **a**" using additional dilution discharges from the reservoirs located on Dambovita tributaries downstream Glina WWTP; **d.** "case **b**" with additional dilution discharges as in "case **c**".

The results from all four scenarios with time series concentrations for the considered constituents were included in an ArcGIS Online web application developed for water boards and interested stakeholders. The information shared via ArcGIS Online is represented as water quality maps, with animations and offers a fast solution to disseminate modeling results.

Keywords: modeling accidental pollution, Mike 11, advection dispersion module, web application, ArcGIS Online

DEPENDENCE OF SALT LAKE WATER RESOURCES IN THE SOUTH OF WESTERN SIBERIA ON CLIMATE CHANGE

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ABSTRACT

Numerous salt lakes in the forest-steppe zone of Western Siberia can boast with unrivaled biological productivity. They possess a great economical and ecological value, being used for centuries as important sources of water. At the same time, excessive anthropogenic pressure, accompanied by intensive land reclamation works, led to massive destruction of these natural systems. Also, the lakes suffer from natural cause of degradation, due to the change of the territory humidity degree and drainage of wetlands. This change occurred when the moisture reserve, previously allowing all wetland systems to endure dramatic changes in climatic conditions, became extinguished. The paper examines the impact of climate change on the condition of salt lakes, located in the south of Western Siberia, and on their individual components, both in inter-century and intra-century perspectives. The study was based on the analysis of cartographic sources, archived material, statistical analysis of long-term meteorological observations. Individual components, determining the water regimes of lakes, were characterized. The water balance of lakes, the territory humidity dynamics, fluctuations of the lake levels during the past 100 years were considered in detail. Synchrony of climatic periods and hydrological regimes of the lakes were described; the determining influence of atmospheric cyclonic circulation on the periodic variations of lake levels was confirmed. Despite the cyclic nature of lake regimes in the south of Western Siberia, the main trend in their current development is a gradual reduction of the aquatic area and its partition into smaller ponds.

Keywords: hydrological regime, climate change, salt lakes, south of Western Siberia

**DRINKING WATER SUPPLY OF TOMSK (WESTERN SIBERIA, RUSSIA):
GROUNDWATER RESOURCES AND QUALITY**

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ABSTRACT

Problem of pure drinking water is one of the main global problems of our time. Underground waters are the most protected from anthropogenous influence, but, despite it, water quality in some areas of intensive water intake doesn't conform to drinking requirements and leads to a certain water treatment. This paper deals with hydrogeological conditions of the Tomsk and Seversk groundwater deposit and with the chemical composition of groundwater samples, which have been selected during the period from 2008 to 2013.

Keywords: drinking water supply, groundwater quality

EFFECTS OF NUTRIENT POLLUTION ON GROUND WATER USED FOR DRINKING PURPOSES

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ABSTRACT

Nutrient pollution, originated from agricultural or household activities, is one of the main issues our modern world has to deal with. Due to the specific aspects this type of pollution implies - the uncertain nature of pollution source, the relative continuous character of the pollution process, the complex environment system implied (soil, surface waters, and ground waters), these issues are difficult to manage and presume an integrated approach and a strategic perspective. The effects generated by this type of pollution are often very serious - large quantities of water affected by eutrophication, having a direct impact over the stability of damaged ecosystems and over biological diversity. Another aspect that gives this phenomenon a special status is *the transborder pollution* character.

Romania, as an EU member, has committed to accomplish the compelling liabilities derived from European Directives. Integrating the two Directives in Romanian legislation - 2000/60/CE and 91/676/CEE – was achieved by adjusting Law 107/1996 and by Government Decision HG 964/2000. These obligations regard achieving a balanced ecological and chemical state of waters, through measures that concern important water management issues: organic substances pollution, nutrients and hazardous substances pollution. In a specific approach included in the process of implementing the 91/676/CEE Directive, Romania has been initially assigned with *nitrate vulnerable areas*, for 255 regions, representing 8.64% of the total surface of the country and, respectively 13.93% of the total agricultural surface.

Meeting the aforementioned Directives requirements imply technical, administrative and social proceedings. These arise from the main targets drafted in the project mainframe „*Integrated Control of Nutrient Pollution*”, as follows: (i) reducing nutrients discharge in water bodies; (ii) promoting behavioral shifts at regional level; (iii) providing support in strengthening regulation and institutional capacity system.

Theoretically, the educational segment - formative and promoting, defined as *Strategy for public informing and replication of project interventions* is designed to provide the necessary set of knowledge in the field, according to specific particularities of a complex target group - authorities, population from the rural environment, of different ages and occupations. The *public awareness program*, as part of the „*Integrated Control of Nutrient Pollution*” project, was structured in two major directions: providing of appropriate training services for target audience sections and media coverage -

promoting shows, materials, and press appearances. By combining these instruments, the knowledge delivered directly to the targeted audience becomes nationally available.

Keywords: Ground water quality, Integrated Control of Nutrient Pollution, Nitrate Vulnerable Zones, spatial distribution, public awareness and promotion of behavioral changes

ELEVATION GRADIENT AND LONG-TERM TREND OF THE WATER TEMPERATURE IN SURFACE STREAMS IN SLOVAKIA

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ABSTRACT

In the first part of the paper the long-term trends of the water temperature are analysed of the high mountain river Belá, and the lowland river Morava. The stations were selected to cover wide range of elevations. The trends were studied on 50-year data series by Mann-Kendal test. The long-term mean annual water temperature of the Belá river was 4.2°C at Podbanské station, and it corresponds very well with the mean annual air temperature, which was 4.9°C. The long-term mean annual water temperature of the Morava river was 11.1°C.

The second aim of the study was to assess the water temperature gradient. The elevation gradient of the water temperature specifies the relation of the water temperature on elevation in natural conditions. It was determined for individual months and year seasons based on data series of 21 stations. There exists the negative relation between the water temperature and the elevation – with decrease of elevation the water temperature increases. The positive relation was observed only in the high mountain Jalovecký creek in specific winter conditions, and during short time periods. During the winter months the elevation gradient is the smallest. The biggest values of the water temperature gradient are observed in small streams during the summer season. The biggest gradient –1.06 °C per 100 m of elevation was estimated in August 2012.

Keywords: water temperature, long-term trends, variability, vertical gradient, Slovakia

ENSEMBLE MODELING IN SOIL HYDROLOGY

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ABSTRACT

Various theoretical parametric particle size distribution models exist which could help with soil texture classification transformations. However, there is usually no best parametric model which is superior under all circumstances. Various parametric models frequently show different degrees of precision in different soils and under different environments. In this paper the authors evaluate whether ensemble modelling could bring some improvement to soil texture transformations, when existing particle size distribution models are used as ensemble members. An improvement in precision was proved, and it is documented in the paper that the ensemble model worked better than any of its constituents.

Keywords: soil texture, particle size distribution, ensemble model, random forests

ENSEMBLE RISK ASSESSMENT FOR FLOOD WARNING SYSTEM IN ST. PETERSBURG

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ABSTRACT

This paper discusses two main classes of tasks for flood risk assessment. The first class analyzes feasible flood damage in the conditions when the barrier system has inoperable state and therefore there is no way to control flood flowing. In this case we use historical data and assessment methods based on principles of extreme value theory. Also for predicted flood that might happen in the nearest time we execute an ensemble on variable input atmospheric data to estimate uncertainty of prediction models. The second class is connected with assessment of produced plans for sluice gate maneuvering. In this case flood evolvement can be controlled. Technical characteristics of the barrier system, model forecast and procedures of plan elaboration add uncertainty in final proposal for making decision phase. Thus the risk assessments also based on ensemble techniques can be useful to decrease possibility of unsafe plan selection. Controllable risk also allows optimizing extent of possible damage.

Keywords: floods in Saint-Petersburg, ensemble forecast, probabilistic risk assessment, uncertainty estimation, decision support for flood warning.

EVALUATION AND ENHANCEMENT OF ENERGY SECURITY FOR PROPERTIES

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ABSTRACT

The value of properties designed for dwelling and entrepreneurial purposes very often depends on energy sources. To the basic energies, without which any building cannot be used, a resource of drinking water and very often, especially in industrial buildings, also a resource of fire fighting water belong unambiguously. A lack of this energy resource and simultaneously food decreases the user's value of the building, and in case of extraordinary or crisis situation, leads even to putting the building out of service.

The presented article analyses the current situation, evaluates the state of possibilities and knowledge in the given area and outlines techniques and methods for achieving the higher levels of use value and safety of buildings at minimal investment and operating costs.

Keywords: building, dwelling, functional building, water resource, drinking water

**EVALUATION OF THE HYDROCHEMICAL ELEMENTS OF THE WATER
QUALITY IN THE WATER RESERVOIRS BY USING JOHNSON
 S_B DISTRIBUTION**

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ABSTRACT

Recently, in the engineering hydrology, Johnson S_B distribution has been increasingly used as a distribution law for average annual discharges of a flow. It is the first time the authors of the present paper have taken Johnson S_B distribution as a distribution law for different elements of the water quality in the water reservoirs of Georgia including coastal waters of the Black Sea. The research has been conducted with the help of EU funded project “PERSEUS” and taking into account the principles of MSFD to diversify the methods of hydrochemical parameters analysis.

Compared to other types of distribution, the advantage of Johnson S_B distribution is that the given distribution describes the process of variation of different hydrochemical elements in the water pretty well, can take various forms, while plotting the curves of distribution density and provision is much easier with Johnson S_B distribution than with other types of distribution. Besides, Johnson S_B distribution has a simple relation with normal sequence and it is simple and convenient to model artificial series.

One of the major issues with using Johnson S_B distribution is the identification of the upper and lower limits of a random variable. Therefore, it is assessed in detail for different hydrochemical elements in a water reservoir.

The limits of Johnson S_B distribution for hydrochemical elements were assessed by method of choice provided the distribution curve of the statistical provision values was maximally close to the even distribution, and were later assessed with the Kolmogorov criterion.

Keywords: hydrochemical elements, distribution law

**EVALUATION OF THE SAFE OPERATION OF HYDROTECHNICAL
CONSTRUCTION, THROUGH ACQUISITION SYSTEM, TRANSMISSION
AND PROCESSING SIGNIFICANT PARAMETERS**

Considerations, conclusions and recommendations regarding the reliability of measurement and control, based on a statistical approach, the percentage result of assembled and functional in the analysis.

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ABSTRACT

This work aims to establish the reliability, following a statistical approach, based on a percentage, result, between fitted and functional, for a range of measurement and control, mounted under the administration of the Romanian Water dams, namely: dilatometer clamps, direct pendulums, pendulums reverse, rockmeters, piezometers open, gauging devices for measuring underpressure, interstitial pressure cells and total cell pressure..The study was done for a total of 51 dams that are in all the river basins of Romania. It analyzed how many of the devices listed above were fitted to commissioning and read longer works at the moment. In the analysis of the percentage result can draw a conclusion on reliability, each unit of measure.

Keywords: monitoring dams, dilatometer clamps, direct pendulums, pendulums reverse, rockmeters, piezometers open, gauging devices for measuring underpressure, interstitial pressure cells and total cell pressure.

EXPERIMENTAL INVESTIGATION ON RECTANGULAR CONTRACTED WEIR FOR MEASURING FLOW RATES FROM SUSTAINABLE URBAN SYSTEMS

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ABSTRACT

The management of runoff and the control of its impact on the environment is typically complex, due to the continued evolution of urban reality and the interaction of different factors, not just technical, but also political, social, environmental and economical. In recent decades the concept of sustainable engineering has spread to cope with the problems of energy conservation and pollution. Low Impact Developments (LIDs) such as green roofs and porous pavements have been introduced for managing urban drainage water and reducing stormwater pollution. Such systems are subject to highly variable and unsteady hydrologic loading typical of small watersheds.

The accurate and precise estimation of the effluent hydrographs from a LID is essential to evaluate the retention capacity of the system and the corresponding effluent volumes delivered to the drainage network. However, to date conventional flow rate measuring instruments are not able to accurately detect a large range of flow rates and a combination of more devices covering different ranges of flow rates has been often used.

A device with a rectangular contracted weir integrated with a transducer level for measuring effluent flow rates from a LID was proposed. Such device, previously calibrated, was tested under a large range of hydraulic loadings.

The effect of parameters such as viscosity, surface tension, weir geometry, Reynolds number on the discharging coefficient was investigated for different flow rates by using a variant of the Evolutionary Polynomial Regression (EPR), a MS – Excel function based on Multi-Objective EPR technique (EPR-MOGA), called EPR MOGA XL as a data-mining strategy.

The results showed that the discharge relationship for the rectangular contracted weir was well interpreted by traditional formulas used in the literature. The findings also demonstrated Weber number highly influences the discharging coefficient of the rectangular contracted weir. A formula relating the discharge coefficient with Weber number was, therefore, defined for more precisely measuring the effluent flow rates from such device.

Keywords: Data-mining, EPR, Hydraulic measurements, Sustainable urban systems, Urban hydrology

**EXPERIMENTAL RESEARCH OF FACILITIES
OF ENVIRONMENTAL PROTECTION OF HYDROSYSTEM
TAILRACES FROM EROSION**

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ABSTRACT

During operation of hydrosystems, a number of environmental problems, associated with the water-race conjugation by the transition from a protected part of the apron to the loose erodible bed, appears. By significant flow velocities, an erosion pool develops which can lead to loss of the hydrosystem stability.

For the environmental protection of the tailrace facilities by the operation of hydrosystems, devices characterized by deployment and installation mobility are required. Effective hydrodynamic controllers of the near-bottom flow rate can be developed based on the theory of a profile, flowed round by fluid. The constructive design of such devices may be fulfilled based on the profiles made of flexible materials.

To determine the parameters of the flexible profiles, it is necessary to determine experimentally the regularities of the flow distribution in the tailrace in different operating modes of gates and its influence on the depth of erosion.

Experimental research of the tailrace bed erosion was performed on a scale model of the overflow weir of Cheboksary hydropower station in the hydraulic flume.

For the open flows having non-deformable bed, a basic criterion of dynamic similarity is the Froude number.

Work of the stream, by erosion of the bed formed with viscoplastic soil, was investigated on the basis of the dimensional theory. The regression dependence of the model diameter on the value of the soil adhesion was obtained.

To measure the flow velocity in the model flume, a measuring system was developed based on heat-loss anemometers with an analog-digital converter and computer data logging.

During the homing experiment we tested representativeness, accuracy, reliability, uniformity, variability, distribution of the recorded data. Check of the reproducibility of the experiment results was carried out by the Cochran criterion. Adequacy of the received data was evaluated by Fisher's fitting criterion. Comparison of experimental measurements of kinematic characteristics obtained on a laboratory model, with actual values, showed good convergence.

The nature of erosion in different operating modes of gates was studied. On the basis of measurements, we constructed lines of equal depths and isotachs for each flow rate and set the maximum depth of erosion.

The model device for controlling the bed erosion in the hydrosystem tailraces based on the down-dropped airfoil was tested. The tested airfoils were installed in the hydraulic flume in the place of the flow descent from the model weir apron. The test of the model

device was carried out with the most unfavourable operation mode for gates in relation to erosion and extreme water flow. A reduction of the maximum depth of the erosion pool during work of the airfoil was established.

Keywords: experiment, hydrosystem, tailrace, environmental protection facilities, river bed evolution, similarity criteria, processing and planning an experiment

**EXTREME WAVE SPECTRA IN THE NEW GENERATION HANDBOOKS
ON WIND AND WAVE CLIMATE**

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ABSTRACT

Extreme spectra are a subset of the ensemble of climatic wave spectra corresponding to severe storm conditions in a sea with the certain return period. There are at least five classes of climatic spectra in the World Ocean, namely: wind waves, swell, wind waves and young swell, matured swell and wind waves, complicated wave fields. The parameters of climatic spectra and extreme spectra are describing by means of their joint distribution. The approach to design the extreme wave spectra is developed and partly realized in the new generation of wind and wave handbooks published by Russian Maritime Register of Shipping. Particularly, for Japan, Kara, Bering and White Seas climatic directional wave spectra (for return periods up to 100 years) are calculated.

Keywords: sea waves, swell, climatic spectra, extreme spectra, spectral classification, hindcasting, peakedness, complex sea.

FISH PASS AND SLIDE FOR RECREATIONAL BOATS IN ONE MULTIPURPOSE STRUCTURE

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ABSTRACT

The paper is dealing with the planned multipurpose structure, which will be used for the fish migration and also for the recreational boat transport. These different requirements led to the creation of the mathematical model. The preliminary design was solved via one dimensional software HEC-RAS. For the better and more detailed result description was created also two dimensional model in the River2D software, where are clearly seen velocity fields as well as in the area of the slot.

Keywords: multipurpose structure, hydraulic parameters, mathematical modelling

**FLASH FLOODS ON A FORESTED AND HEAVILY POPULATED
CATCHMENT. CASE STUDY FOR SUHA BASIN (ROMANIA)**

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ABSTRACT

This analysis of the evolution of the most important flash-floods of the Suha River basin outlines a clear picture of their triggering factors and their way of manifestation. The most significant flash-floods occurred in 1975, 1981, 1984, 1991, 2005, 2006, 2007 and 2008. The highest flows recorded at the gauging stations were: 175 m³/s at the hydrometrical station Stulpicani (Suha) in 1981; 95.5 m³/s at the hydrometrical station Gemenea 5, on Slatioara River in 2008; and 42.8 m³/s at the hydrometrical Gemenea 2, on Gemenea River in 2006. The quantities of rainfall that led to these flash floods were not very high, but the duration, to which shall be added the characteristics of the morphometric basin, generated a quick and increased concentration in the water level. Massive afforestation cannot completely stop the flooding. The effects are obvious in the areas occupied by human settlements and on economic objectives. Floods in sub basins of equal areas are similar. Extended deforestation surfaces in the upper basin spawned some local torrential rainfall generating floods on the main collector (Suha). The local rainfall is underlined by the existence of isolated flooding.

Keywords: Flash-flood, Flooding, Rainfall, Romania, Land use

**FLOOD RISK ASSESSMENT FOR THE OZANA RIVER SECTOR
CORRESPONDING TO LEGHIN VILLAGE (ROMANIA)**

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ABSTRACT

The purpose of this study is to accurately estimate the flood affected areas for Leghin village, which is situated on the Ozana river flood plain, in Romania, by combining GIS dedicated software and statistical analysis. A comparison was made, between an automated flood simulation method, designed specifically for hydrological analysis (HEC-RAS), and a manual method consisting of a combination between a GIS dedicated and an image processing software (TNTMips and Gimp), using the same input parameters. The Ozana river, located in Neamț county Romania, has a large negative impact on the 9 villages and 1 major city (with a population of over 42 000 people), it flows through, when a flood occurs. The average flow rate was calculated at 2,2m³/s (for Leghin hydrological station), but it has reached a maximum historical value of 250 m³/s, causing significant damage. The flood analysis has been made for river flow rates, specific to two occurrence probabilities (0.1% and 5%), calculated through statistical methods, such as Pearson III, which was used to determine the occurrence probability (the method was validated for Romanian hydro-meteorological conditions) and Weibull distribution, used to identify the flow rate values, for an extended period of time. After generating the flood simulation, corresponding to a water level specific to the 0.1% probability, a number of 30 buildings subjected to flooding were identified, and a large surface of arable land was estimated to also be submerged. The areas where the vulnerable buildings are located (referring mostly to houses and sheds), are estimated to be covered by a 40 – 80 cm water level. The final results reveal the areas that are subjected to flooding, calculated through both HEC-RAS, and the combination of GIS & image processing software method, at the chosen probabilities. By comparing results from two different flood analysis methods, we are able to more accurately emphasise the areas affected by floods. This is also a good method to validate one method through the other, and observe substantial result deviations.

Keywords: flood zone, HEC-RAS, GIS, probability, simulation, statistical analysis

**FLOODPLAINS EVOLUTION ANALYSIS AND IDENTIFICATION OF THE
POTENTIAL WETLANDS RECONSTRUCTION IN THE
ROMANIAN –BULGARIAN COMMON SECTOR**

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ABSTRACT

This paper was accomplished in the framework of Danube Water integrated management, code MIS 161–WATER project, co-financed by the European Community Commission, in the framework of Romania-Bulgaria cross-border cooperation program, having as main objective the development of a common management and monitoring system for water quality in extreme environmental conditions, including providing a data and information dissemination mechanism, necessary for the regional development of the border area. Our paper aims to analyse the evolution of wetlands during a long period of time, as base for the spatial analysis for identification of best areas to create the wet areas for fisheries and for ecological touristic activities. An evolution of the embankments of Danube border, the droughts period of time and the agricultural works are also presented as potentials sources for the reduction and disappear of wetlands areas. A comparison between the land use from different years, such the 20's, 70's and 2006 years, is done using a GIS platform.

Keywords: wetlands, Danube plain, Danube Water

GROUNDWATER IMPACT ASSESSMENT ON BUILDINGS FOUNDATION

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ABSTRACT

Groundwater is one of the forms in which water is found throughout the nature. Groundwater movement in natural conditions, but mainly in terms modified by hydrotechnical works, or whatever they are, forms the subject of groundwater hydraulics. Solving the various issues found in practice constitutes the technical and applicative part with a vast coverage of groundwater. The construction engineer performances regarding the buildings foundation is tightly connected with the groundwater level, especially in areas where the groundwater level is high. The paper, show computing models, based on boundary element method, which provides variants for lowering the groundwater level under the foundation terrain.

The paper also show a case study for the how to prevent the possible damages that underground water could have on construction and especially on their foundations, in order to ensure their proper operation.

Keywords: building foundations, flow model, urbanization, groundwater level

HISTORICAL EXAMPLES OF WATER ENERGY USE IN SLOVAKIA

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ABSTRACT

Slovakia was one of the industrially most advanced areas of former Hungary. This was particularly due to the development of mining enterprises for production and treatment of precious metals (gold and silver), non-ferrous metals (copper) and iron ores, in addition to dynamic developments in metallurgy. The mining and metallurgic hubs also prompted further developments in science, technology and culture, accelerating application of new knowledge. While water was a constituent of mining's development, it also posed an almost fatal issue for the latter's existence as it served – as the virtually single only available source of energy of the time - as the driving force for different mining facilities. Use of water wheel for mining purposes is documented as early as in 13th century. It was the first facility for converting hydro energy into mechanical energy that was used to drive lifts, hammer mills, stamping mills, pumps and in smelteries. To have abundant water, entire generations have been building ingenious systems of upstream waterways (feeders) and water reservoirs including well-known systems such as those of Turček and Špania Dolina.

Keywords: water energy use, Turček water supply system, Špania Dolina water supply system, small hydro power plant

HYBRID MODELLING IN FLOOD RISK MANAGEMENT

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ABSTRACT

The article is aimed at the clarifying several aspects of dynamic water behaviour near lateral spillway using the three-dimensional CFD numerical model supported by physical research. Hybrid modelling combines the benefits of physical/experimental research and mathematical modelling into one concept capable of accurately and efficiently finding solutions for a wide range of tasks of many industries. Although both methods of physical research as well as mathematical modelling are independent and able to solve problems, their combination is the perfect way to approach a problem.

Keywords: Hybrid research, three dimensional simulations, Fluid dynamics, Physical research, lateral spillway

HYDRAULIC FACTORS INFLUENCING THE RIVER BED THAT ARE CAUSED BY RIVER NAVIGATION

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ABSTRACT

Paper deals with navigability issue of river lower section of river Váh. Current parameters of the fairway at lower section of river Váh don't meet the needs of safe and capacitive waterway transport. Navigation conditions are still not sufficient enough for river navigation especially in the stretch waterworks Selice – Komárno (approx. 44 km). Only a limited river navigation is currently possible in this section. It is necessary to build waterworks (the WW) Kolárovo and to modify the river bed by applying the appropriate measures.

The speciality of lower section of river Váh represents the dynamic sediment mode of river bed that is caused mainly by grain composition (fine sands and clay). By more intensive river navigation the dynamic sedimentary mode will also be more intensive. This paper is mainly focused on the explanation of hydraulic loads of river bed which are caused by river navigation. Undulation, convection, rapid decline of the water level, backwater of the water level and the inflow of groundwater are among the effects occurring during river navigation. There is a need the river banks are durable enough in order to ensure the stability against these effects. It is necessary to look for river bank ensuring solutions for reaching the maximal integration of river bank into the environment and also for meeting the purpose of slope construction. Proposed measures need to be appropriately chosen so that the banks and the river bed will be withstanding not only the natural events but the prepared river navigation also.

Keywords: River Váh, River navigation, Hydraulic factors

HYDRAULIC FRICTION COEFFICIENT OF STREAMS DUE TO SEDIMENT TRANSPORT

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ABSTRACT

The paper presents the influence of riverbed morphology on the flowing resistance and water head losses. The mechanical work of friction forces in the river bed shows that the dunes correspond to the minimum value of dissipated energy. The foreign and Romanian researches, assume higher values of flowing resistance in the conditions of existing dunes than in the conditions of flat riverbeds. The results were obtained by laboratory modeling. The experiments were conducted into a 600 cm long, 30 cm wide and 20 cm deep rectangular flume. The upstream section consists of a reception area for sediments. A fixed bed to ensure the turbulent boundary layer was fully developed before reaching the test section. The test reach was composed of a movable bed with fine sediment to a depth of 10 cm. The downstream section consists also in a fixed bed and has a sand trap. The sidewalls of the flume were made of glass, while the flume itself was constructed on pillars. The airflow on the model is due by a fan working in aspiration stream. The experiments have shown that, at low depth of stream, the dunes determine lower hydraulics resistances. These results could be explained by reshaping of riverbed, head loss having minimum values. These results have to be validated by a new series of experiences, and the paper suggests the future research directions.

Keywords: Friction Coefficient, Flume, Laboratory modeling

HYDRODYNAMIC ANALYSIS OF CONTAINED FLUID EFFECT IN RIGID RECTANGULAR TANK DUE TO EARTHQUAKE EVEN

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ABSTRACT

Ground-supported tanks are used to store a variety of liquids. The fluid was developed the hydrodynamic effects on walls and bottom of tank during an earthquake. This paper presents fluid behavior during an earthquake using numerical model of seismic response of fluid in rectangular tank - the endlessly long shipping channel using of Finite Element Method (FEM) in software Adina. As the excitation input we consider horizontal earthquake load given by the accelerogram of the earthquake in Loma Prieta, California (18.10.1989).

Keywords: fluid, earthquake, Finite Element Method (FEM)

HYDROLOGICAL MODELLING OF WATER INFILTRATION IN URBAN SOILS. CASE STUDY OF IASI MUNICIPALITY (ROMANIA)

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ABSTRACT

The post-communist period (after 1989) caused important changes in the functional structure of Iasi municipality. The partly dismantling of the industrial area, the urban sprawl against the periurban and agricultural space, the new infrastructure works, all these determined important changes of water runoff of urban area and soils' physical and morphological properties (e.g. porosity, density, compaction, infiltration rate etc.). This study aims to evaluate the infiltration rate in urban soil of Iasi municipality and identify spatial patterns of infiltration of water in urban areas through combination of statistical and geostatistical methods intended for a correct spatial representation. Water infiltration in urban soils was analyzed in relation to land use and type of soils. Field investigations consisted in measurements of the water infiltration (by the means of Turf Tech infiltrometer), for 69 equally distanced points (750 m x 750 m) placed in a grid covering more than 33 km². For each analyzed sector (residential areas, industrial areas, degraded lands, recreational areas - parks and botanical gardens, forests heterogeneous agricultural lands), the variation curve of the infiltration rates is different depending on the land use and the importance of soil horizon transformation. The results were mapped using the facilities of ArcGis 9.3 software, through different interpolation methods (IDW, krigging).

Keywords: water infiltration rate, urban soils, hydrological modelling, spatial analysis

HYDROLOGICAL PERFORMANCE OF A PERMEABLE PAVEMENT IN MEDITERRANEAN CLIMATE

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ABSTRACT

Permeable pavement represent one of the most important Low Impact Development (LID) techniques. It is usually used to reduce runoff volume, peak-flow and pollutant load. Although the lack of adequate modeling tools is a limiting factor in the diffusion of permeable pavements. The modeling of infiltration phenomena in porous medium is extremely complex due to his strongly unsaturated character. For this reason in this research a modeling application on an innovative permeable pavement in University of Calabria is presented. The HYDRUS-1D software has been used to simulate the infiltration phenomena involved for his capacity to correctly describe the hydrological behavior of porous medium under different boundary conditions. In particular a dual-porosity model with a mass transfer equation has been applied. Several events have been used to assess the predictive performance of the HYDRUS model. The modeling results have been compared with the experimental data in terms of outflow using several statistical index. Results confirm the suitability of the HYDRUS model in predicting the hydrological behavior of permeable pavement.

Keywords: permeable, HYDRUS, pavement, infiltration, LID

**HYDROLOGICAL TIME SERIES INVESTIGATION AND FORECASTING
USING “CATERPILLAR” – SINGULAR SPECTRUM ANALYSIS APPROACH**

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ABSTRACT

“Caterpillar”- SSA is a new powerful model-free technique of time series analysis and forecasting. It combines advantages of such methods as Fourier and regression analyses and has simple visual control aids. In this paper the application of the method is considered for two examples: the analysis of Baltic Sea water level in three points and Timpon river in Saha (Siberia, Russia) discharge in one line gauge.

Keywords: time series, singular spectrum analysis, trend, periodical components, forecasting, river discharge, water level.

**ICE COVER DEVELOPMENT IN A SMALL WATER BODY
IN AN UNDRAINED DEPRESSION**

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ABSTRACT

The study was conducted in a small post-exploitation water body (50°18'27.72" N, 19°06'42.76" E) located in the southeastern part of the town of Czeladź (southern Poland). The pond has an area of one hectare and a five-hectare contained catchment basin bordered by road embankments. Catchment area is 5 hectares of which falls on 1 ha of water body. When the pond's water level is at an altitude of 264 m a.s.l., the water body is 2.5 m deep and has a capacity of 8.9 thousand cubic metres. The water is supplied by surface runoff and shallow ground waters. The purpose of the cryological studies conducted in the water body examined alongside meteorological observations was to identify the mechanisms of ice cover development in a small water body situated in an undrained depression. The observations were made daily with some more frequent visits, i.e. 2-3 times a day. It involved the mapping of ice processes. The studies conducted revealed the presence of ice cover of varying thickness and structure. Within ice cover, the following types of ice were identified: crystal ice, turbid ice, water and snow ice, two-layer and multilayer ice, aufeis, frazil ice and water. It was found that in some cases, the thickness of ice cover increased from below (the freezing of limnic water) and in some cases from above (the freezing of rainwater or snow and snow ice). For two-layer ice with a layer of water inside, there were cases where the upper layer was freezing from below while the lower layer was melting from above. During the melting of ice cover, ice loss occurred primarily from below.

Keywords: ice phenomena, ice cover, limnic processes, water bodies, lakes, Silesian Upland

**IDENTIFICATION OF DESERTIFICATION RISK WITH
ENVIRONMENTALLY SENSITIVE AREAS: APPLICATION TO AN AREA IN
SOUTHERN ITALY**

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PhD Antonello Mancuso

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ABSTRACT

Desertification, or degradation of arid areas, is nowadays widely recognized as a major environmental problem that can severely compromise the sustainable development of the Mediterranean area. This process, often considered as a problem concerning developing countries, also involves developed countries and it is known that arid and semi-arid environments cover 40% of global earth surface where 1 billion human beings live.

After the analysis of desertification indexes, this paper considers a prone area in Calabria region and proposes a parametric procedure defined IDEAs (Identification of Desertification with Environmentally Sensitive Areas) based on the MEDALUS approach in an area of the upper Ionian sea territory (Villapiana municipality, Calabria Region, Italy).

This procedure exploits the ESAs methodology having the peculiarity that it gives a solution independent from the number and information layers that constitute the base layer. The model evaluates some quality indexes (climate, soil, vegetation and management), each evaluated as a function of the different base indicators considered that, being representative of the different erosion processes (such as erosion, evapotranspiration, drought resistance), help to define desertification in the study area.

Keywords: climate changes, desertification, hydrology, land management, monitoring

IMPACT OF PUMPING FROM SNOW-UP LAKES IN MOUNTAIN REGION ON GROUNDWATER LEVEL REGIME

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ABSTRACT

The goal of the contribution is by means of numerical modelling of groundwater flow to define the optimum water pumping from snow-up lakes in mountain region of High Tatras. For design of such lakes (gravel pits) and determination of changes in groundwater level regime when pumping the water from them a conceptual model has been elaborated by means of numerical modelling using finite element method for groundwater flow simulations [1]. After calibration and verification process an unsteady groundwater flow model was the best tool for optimisation of surface and subsurface water system with respect to the environment in National Park of High Tatras. Contribution has to be considered as an applied numerical modelling case study for groundwater flow, its analysis, prognosis and determination of pumping scenarios on groundwater level regime in mountainous region. For finite element modelling a TRIWACO simulation package of groundwater flow has been used [2].

Keywords: optimum water pumping for snow-up of hills, groundwater level regime, finite element modelling

**INTEGRATED SYSTEM FOR SEWER SYSTEM DESIGN
AND EVALUATION - SEWACAD**

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ABSTRACT

The paper describes the model, which was developed at the Department of Sanitary and Environmental Engineering at Faculty of Civil Engineering, STUBA in Bratislava. The system is integrated environment designed for the solving the rules on combined and separated sewer system. Environment SeWaCAD includes many of procedures, which allow solve the hydraulic and hydrologic problems of urban areas. The paper shows the type of rules, which is possible to solve and describe the system composition. The results of this system consist from calculations and drawing suitable for CAD systems. The outputs are not only hydrotechnical computations but also the drawings of longitudinal profiles of designed sewer pipes or evaluated sewer profiles. These outputs provide to the sewage investor and operator the relevant data, which are possible to use for the reconstruction and rehabilitation [10]. Simple rule of this system is the design of sewer systems, which especially important for present situation concerning the connection of users on public sewer system in Slovakia.

Keywords: Sewage design, evaluation, stormwater, surface runoff, CSO

**INVESTIGATING THE CORRELATION BETWEEN AGRI-
ENVIRONMENTAL MEASURES AND GROUNDWATER NITRATE
CONCENTRATION USING A GEO-STATISTICAL APPROACH**

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ABSTRACT

In order to minimize the negative environmental impacts of agriculture, the EU has implemented agri-environmental programs. This study investigates the correlation between the implementation of these measures and the groundwater nitrate concentration in Baden Wurttemberg (Germany). Only the measures that would have a direct impact on groundwater quality were chosen and their extent was attributed to each county from 2000 to 2012. Using ordinary kriging and weighted raster calculation, groundwater nitrate concentration maps were generated from 1990 to 2012. Using ArcGIS 10.1 and R statistical software, the correlations between the evolutions of groundwater nitrate and implementation of agri-environmental measures were determined using Spearman's rho and the corresponding p value, using three different methods. Also the evolution of groundwater nitrate concentration was determined for different land use types for the period of 1990-2012.

Results varied slightly between the different methods, but definite patterns were visible: there were significantly more negative correlations (also with a much higher rho) than positive ones; in some instances negative correlation coefficients went above 0.9 ($p < 0.05$) and a relatively large number exceeded 0.8 ($p < 0.05$), while in the case of the positive correlations very few even reached 0.8 ($p < 0.05$). The counties which showed the highest number of correlations (with $p < 0.05$) were mostly the same counties which showed the most intense correlations (more so in the case of the negative correlations).

Two of the eleven studied measures showed intense and numerous positive correlations and very few and weak negative correlations; these were the only measures that overall decreased in the study period. The rest had relatively similar negative correlation frequencies and intensities to each other, with four measures standing out above the rest (organic farming being the highest). The groundwater nitrate concentration remained relatively stable in the study period for the different land use types, with a slight increase in the areas covered by forests and a significant decrease in the areas covered by arable land. Relative to one another the average nitrate concentrations showed the following pattern: arable land > permanent crops > heterogeneous agricultural areas > pastures >= urban fabric >= industrial, commercial and transport units > forests > artificial non-agricultural areas > scrubs and/or herbaceous vegetation.

Keywords: agri-environmental measures, groundwater, nitrate, kriging, correlation

INVESTIGATION OF HYDROLOGICAL PROCESSES IN THE LAKE PART OF LOWLAND RESERVOIRS OF THE VOLGA BASIN

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ABSTRACT

Thermal stable stratification was investigated in the lake part of lowland Gorky reservoir during field studies in June-October 2013. In late May and early June the seasonal heating of water upper layer produced pronounced thermal stratification before bottom mud was not heated enough. By the middle July the thermal stable stratification produced by was destroyed under the influence of strong wind. Under these conditions stable thermocline-type stratification was formed as a result of diurnal heating of the upper layer by 0.2...1.0 °C. Classification of types of stratification was proposed to identify its role on water quality of plane river reservoirs. Parameters of stability of stratified flow in the reservoir in terms of the Brent frequency and Richardson number were estimated. A significant decrease in species production and diversity was associated with the seasonal decline in temperature. Preliminary conclusion about the effect of stratification is that the bundle leads to increased concentrations of cyanobacteria and their dominance, while stirring enhances diatoms competitiveness.

Keywords: lowland reservoirs, thermal stratification, water quality, algae bloom.

KOLÁROVO WATER STRUCTURE – PREPARATION OF THE RESEARCH AND DESIGN PROPOSALS

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ABSTRACT

In 2012 was within the Research and Development Program of the Ministry of Transport, Construction and Regional Development of the Slovak Republic realized the study of research, design and implementation of the Water Structure Kolárovo on the river Váh. The objectives of the preparatory study was to particularly identify suitable locality of the water structure, determine the composition of the hydraulic objects, determine hydraulic and hydrological parameters of the structure, determine the parameters of the operation performance and determine the workload and methodology of further detailed research for optimal design parameters and performance standards.

This article briefly summarizes the results of the preparatory study on the research and design work.

Keywords: Kolárovo Water structure, preparatory study, river Váh

MATHEMATICAL MODELLING OF FUNCTIONING OF STORMWATER OVERFLOW DIVIDER WITH A CONICAL VORTEX REGULATOR

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ABSTRACT

Current methods of designing overflow dividers do not take into account the frequency of storm discharges to the receiver, as well as they do not offer the possibility of their duration and volume determination and thus they do not allow for the assessment of pollution load that is drained off in discharges towards receivers. The simulations of overflow dividers functioning allow for determination of these parameters for already designed dividers and for any assigned load. Therefore they constitute a valuable instrument supporting the process of designing this type of objects. A simulation of the functioning of a modern dividers with a cylindrical vortex regulator on stormwater sewerage system was conducted in this work. For the modelling of overflow divider activity a drainage area of $F = 40$ ha was suggested.

Keywords: sewerage systems, overflow divider, vortex regulator

**MINERAL GROUNDWATER RESOURCES AND HEALTH TOURISM
IN THE EASTERN CARPATHIANS (ROMANIA)**

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ABSTRACT

The very diverse hydro-chemical characteristics of the waters, with diverse content of dissolved substances and belonging predominantly to the bicarbonate-chalybeate-carbonated type in over 60% of the cases has had as results a development of great variability of resorts. Most of the resorts present the advantage of various curative possibilities, as well as the accommodation capacity and the curative bases were connected to the catchment volume of waters, which is essential in external cure procedure. Taking into consideration the natural factors, the infrastructural component were built to bring their contribution to health tourism: treatment facilities, different type of accommodation capacities, leisure activities and sports component, green spaces. The hydro-mineral sources determined the appearance of two types of resorts: the balneoclimateric resorts (spas) and the mountain climatic resorts (for winter sports). First are of national interest being generated by the mineral waters with a various hydrochemistry, predominantly belonging to carbogaseous, bicarbonated, ferruginous of the post volcanic gases area. These are at least two centuries old and have the profile facilities located in connections with hydromineral resources. The touristic areas containing the component specific to this type resorts are concentrated at the periphery of some settlements that have become health resorts-town (like Vatra Dornei) or integrated as centres within the residential areas of resort towns (Covasna) or occupying the entire residential area of the resort-town (Slanic Moldova, Baile Tusnad).

Keywords: groundwater resources, water quality, spatial distribution, health tourism, resorts

MODELING OF HYDRAULIC BEHAVIOUR OF GREEN ROOF IN CATCHMENT SCALE

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ABSTRACT

In the last decades the increase of urbanization has drastically modified the hydrological cycle; in particular, while the extension of impervious surface has increased the runoff and hence, the potential for flooding, the reduction of green areas has caused the formation of urban heat island and consequently, the increase of the energy demand. Another negative effect of urbanization has been a severe decline of biodiversity. In this context a comprehensive land planning and engineering design approach with a goal of maintaining are needed to restore pre-development hydrologic regime of urban and developing watersheds. At the University of Calabria GIs were designed and built to develop a sustainable approach example of university campus; the project is called “Urban Water Park”. The park consists of a green roof, a permeable pavement and a biofiltration system. From the hydraulic point of view the parameters retrieved are rainfall, influent and effluent flow rates, humidity and water content in the soil substrate. For each facility the main pollutant (eg. TSS, heavy metal, PAH, COD) are monitored. From a thermo-physical point of view temperature and solar parameters are measured. Green roof techniques are increasingly becoming popular among the Low Impact Developments (LIDs) techniques for urban runoff management. Of particular interest is the rooftop runoff management on large time scales (eg. annual). Several studies have shown that green roofs allow to effectively control the generation of surface runoff, significantly reducing the overall discharged volumes (40% to 80%) as well as slowing the contribution to the urban drainage network.

This study proposes a conceptual model based on the SWMM model to predict the hydrological benefit of a green roof in a large watershed for daily simulation. The model idealizes the green roof as a system consisting of three individual components in series, each characterized by a specific process hydrological and hydraulic. A mass balance equation is applied to each block, taking into account the specific physical phenomena occurring in each module, and the flow is governed by Richards equations. The model is validated with the data observed from the monitoring campaign (climatic, thermal-hydraulic parameters) of a full-scale green roof characterized by different drainage layers and vegetation species.

This study aims to provide quantitative information about the hydraulic performance of green roofs in large watershed for daily series of rainfall, and to identify the most sensitive parameters, such as retained volume, runoff delay for modeling the hydraulic behaviour. The results show that the ability of water regulation is a function of weather-climatic conditions, plant species and green roof design characteristics.

Keywords: SUDs, stormwater, green roofs, runoff, conceptual model, monitoring, water storage.

MODELLING LARGE - SCALE HYDRODYNAMIC MODEL USING HEC-RAS**Dr. Michal Podhoranyi¹****Tomas Kocyan¹****Dr. Dusan Fedorcak¹**¹ IT4Innovations, VŠB – Technical University of Ostrava, **Czech Republic****ABSTRACT**

The construction of accurate numerical hydrodynamic models is an important task for flood simulations. Accurate modelling is essential not only for flood simulations but also for detection of events that can cause damage on property or human lives. This work presents a comprehensive methodology for building of hydrodynamic model on large area (approx. 1000 km²). The model was built using 1-D hydrodynamic program HEC-RAS. Study area is Ostravica catchment (827.4 km²). Which is located in the north-east of the Czech republic. The study area was selected on the basis of the accessibility of topographic data and regularly repeated events.

The model was subdivided into 24 unique schematizations which were joined with boundary conditions (mainly flow hydrograph or rating curve). Boundary conditions have been obtained from river stations which cover the whole catchment. Manning's values, contraction and expansion coefficients were applied across the whole domain. Manning roughness coefficient was used in the Manning's formula for flow calculation in open flow channels. Usual Manning's value for channels in Czech Republic is 0.035. The values outside the river channel were derived from the land cover layer. Storage areas, bridges and other obstacles were included into hydrodynamic model as well. Calibration and validation were separated tasks and were carried out with separate data. The calibration phase was done using May 2010 flood event and the validation was done using August 2009 flood event. The results of the large-scale hydrodynamic model has shown that relatively good match with real state. Developed model may have following problems: problematic parameterization and to maintain all part on the same level of computational accuracy. The problems related to computational time are strongly depended on available hardware.

The calibrated model provides a diagnostic tool for future analyses of flood events. Developed model will be incorporated into the Floreon+ system in the near future.

Keywords: hydrodynamic model, HEC-RAS, flood, modelling

**NATURALLY IRON-RICH GROUNDWATER IN SOUTH-EASTERN
ESTONIA: PROBLEM RELATED TO THE FULFILLING THE DRINKING
WATER QUALITY REQUIREMENTS**

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PhD. Marge Uppin

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ABSTRACT

Groundwater abstracted from the sand- and siltstones of the Middle Devonian (D₂) aquifer system is the main source of drinking water in southern Estonia. Naturally high iron (Fe) concentrations are the greatest problem in this region, complicating to fulfil the EU requirements concerning the drinking water quality. The content of Fe_{tot} exceeds the limit value of 0.2 mg/l set to the drinking water (98/83/EC) in 80% of the analyses. In places the Fe_{tot} concentrations up to 26 mg/l have been detected. High Fe_{tot} concentrations are mainly caused by high Fe²⁺ contents in groundwater, referring to the domination of reducing conditions in aquifer system. In order to produce high-quality drinking water 4 different water treatment systems were used in 9 studied water treatment plants. Filter materials such as Manganese Greensand, Nevtraco and quartz sand were combined with aeration. The results of the study show that Fe_{tot} content in abstracted groundwater (0.12-3.60 mg/l) was reduced to the level of 0.02-0.34 mg/l during the purification process. The systems with pre-aeration remove iron effectively, thus while the oxygen-poor conditions prevail in the D₂ aquifer system, pre-aeration is needed in order to increase the effectiveness of the purification process.

Keywords: water treatment, iron, Middle Devonian aquifer system, Estonia

**ON ROUTE TO INTEGRATED WATER RESOURCES MANAGEMENT
FOR RUSSIAN ARCTIC AND SUBARCTIC RIVERS**

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Assoc. Prof. DSc. George G. Gogoberidze

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ABSTRACT

Until now Integrated Water Resources Management (IWRM) does not exist in Russia as legislative practice. We made research how to ease implementation of this approach in Russia using Arctic and Subarctic as focal area. Besides analyzing real water use system we took into account climate change scenarios, flood management problems and possibilities of decision support systems using. We show that essential changes have to be made in higher education for rapid correction of a situation with IWRM in Russia. We consider deterministic and probabilistic obstacles on this way and present instruments for overcome them. In project planning, primary attention should be given to managing political risk and adequately assess geopolitical risks. Platform https://www.researchgate.net/profile/Valery_Abramov2/?ev=hdr_xprf gave excellent opportunities to preliminary discussion and data exchange in the frame of this research. 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: water use management, climate change, flood risk management, Russian Arctic and Subarctic, decision support systems

ON USE OF DROUGHT INDICES IN MODELLING HYDROLOGICAL PROCESSES

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ABSTRACT

The study considers possibility of use of the drought index SPEI (Standardized Precipitation Evapotranspiration Index) in the analysis and modeling of hydrological processes in the southern Ukraine. The SPEI of various time scale was analyzed for the period of 1950-2010 in the Steppe zone of Ukraine. Time series of the SPEI at scales from 12 to 24 months have an inverse trend in West and East Steppe. In West Steppe the driest period occurred in the two latest decades. On the contrary, in the East Steppe more droughts were observed in the decades of 1950-1970. Statistical relationship between the SPEI of different time scales and some phases of the Southern Bug river flow has been estimated for the period of 1950-2010.

Keywords: Standardized Precipitation Evapotranspiration Index, runoff, drought, high- and low-water phase

OPTIMIZING HYDRO POWER RESERVOIR SYSTEM USING HYBRID OPTIMIZATION APPROACH

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ABSTRACT

This paper describes a hybrid optimization method for finding the optimal operating policy of a reservoir system with water energy utilization. A hydropower plant, in turn, can use its reservoir storage to turbine free water for energy production, thus avoiding fuel expenses with thermal units. The well-timed allocation of hydro energy resource is a complication task, because if water is used in the present period, it will not be available in the future. This hydrothermal coordination problem is solved by peak shaving method using the proposed hybrid optimization method. It combines the genetic algorithms with the traditional numerical optimization method. The proposed hybrid method has been applied on a real hydrothermal system, the Slovak power system.

Keywords: Hydro plant, hydrothermal coordination problem, peak shaving method, genetic algorithms, hybrid optimization

PECULIARITIES OF GAS COMPOUND AND GROUND WATER ORIGIN IN THE NORTHWEST PART OF THE AZOVO-KUBANSKY BASIN

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ABSTRACT

Peculiarities of gas distribution in ground waters of northwest part of the Azovo-Kubansky basin are given in the paper. Gas genesis is studied. The basic role in formation of deposits Azov gas-bearing area belongs to biochemical processes. Lateral and vertical migration brought the certain contribution to modern geochemical shape of the free and dissolved gases on the part of the Azovo-Kuban depression. Due to the quantity of saturated gas in underground waters of aquifer the gas deposit can be found. Water-dissolved gases study allows drawing conclusions about formation of underground hydrosphere to correct a direction of prospecting works on hydrocarbons. These data will be used for an estimation of an opportunity of methane extraction from the water-dissolved gases. The investigation of gases is of great interest, especially of a radon emanation in a ground atmosphere in connection with problems of the ecological safety estimation for the population. The information on laws of distribution of gases in bowels can be used and for geological structure features specification.

Keywords: groundwater, water-dissolved gases, methane, helium, nitrogen

PERIODS OF DRAUGHT IN WATER COMPANIES.

POSSIBLE SOLUTIONS

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ABSTRACT

The paper discusses possible impacts of draught on drinking water supplies in water companies. Supplies of drinking water and discharge/treatment of wastewater are among key services provided by water companies in the Czech Republic. Changes in climate pose a potential threat for a sustainable system of drinking water supplies.

The last winter has been exceptionally warm which resulted in insufficient replenishment of ground water reserves. Because of little snow the reserves of ground water are not big enough and water company, water administrators as well as owners of water wells will probably have to manage consequences of the exceptionally warm winter. If the period of draught continues, there is a risk that the groundwater reserves will not be able to restore its level before the summer starts. This proves that the draught might be an issue which occurs not only in summer. Water reserves in the Czech Republic depend on precipitation in a form of snow in mountains and that in a form of rainfall in lowlands.

The paper discusses the situation in two territories, the result being that the issue should be managed locally. So far, there are only local problems in water supplies in the Czech Republic. But changes in climate are reality which has becoming evident for the past two decades.

First, it is essential to focus on preventive measures which will be preparation for draughts.

Keywords: climatic changes, draught, drinking water, prognosis, actions

POSSIBILITY OF THE MINE WATER UTILIZATION FOR THE DRINKING PURPOSES

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ABSTRACT

Depending on the character and chemical composition of the mine water during specific conditions it can be used as an alternative source of drinking water. The mine water that was used for the experiment was taken at the mine water treatment plant Svatava at the brown coal deposit Sokolov (CZ) and had a character of partially treated water (increased pH value, precipitation of Fe, Al, Mn oxides/hydroxides). Tested mine water with pH value 7.2 and electrical conductivity value 120 mS.m⁻¹ contains 105.8 mg.l⁻¹ of Ca, 52.2 mg.l⁻¹ of Mg, 0.5 mg.l⁻¹ of Fe and of 485.7 mg.l⁻¹ of SO₄²⁻. The mine water samples have been treated according to the requirements for drinking water quality by ion exchange resin technique. During column experiments strongly acidic catex Amberlite IR 120 H⁺ and weakly basic annex Purolite A-100 OH⁻ has been used.

All together 30 litres of mine water has been treated and the exchange capacity of the used resin content (400 ml) has not been exhausted. The treated mine water has been mixed with raw mine water (ratio 1:1.75) to achieve the optimal Ca and Mg content. The mixed water sample has been microbiologically stabilised by adding 0.03 % solution of ClO₂ (dose 0.1 and 0.2 ml.l⁻¹). Treated mine water (after mixing) with pH value 7.4, electrical conductivity value 47 mS.m⁻¹ and content 31.2 mg.l⁻¹ of Ca, 13.4 mg.l⁻¹ of Mg, <0,1 mg.l⁻¹ of Fe and 158.8 mg.l⁻¹ of SO₄²⁻ fulfilled requirements for the drinking water quality in terms of Decree No. 252/2004 Coll. (CZ). Similarly, concentration of Cl⁻ (0.1–0.2 mg.l⁻¹) and bacterial colonies (0-1 KTJ.ml⁻¹) also fulfilled established limits. Therefore, ion exchange resin technique and final mixing of raw and treated mine water resulted in effective possibility of mine water use as the potential source of drinking water.

Keywords: mine water, drinking water, ion exchange resin, sulphates

PRELIMINARY RESULTS OF VULNERABILITY ASSESSMENT OF THE KARST AQUIFER FEEDING PERTUSO SPRING, IN CENTRAL ITALY

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ABSTRACT

Vulnerability assessment of the aquifers is an important tool for the groundwater management and protection. This paper aims to assess the intrinsic vulnerability of the karst aquifer feeding Pertuso spring, which is going to be exploited to supply an important water network of the South part of Rome. The study area is located in the Upper Valley of Aniene river and belongs to an important karst aquifer, mainly composed of dolomitic limestones and dolomites of Cretaceous age. The limestones outcropping in the Upper Valley of Aniene river are deeply fractured and karst erosion has occurred on a large scale in this area. The surface karst activity led to the formation of a typical karst landscape. The hydrogeological framework is therefore closely related to the karst nature of carbonate rocks, constituting the reliefs strongly shaped by surface and underground karst activities. The peculiar fragility of this aquifer, feeding Pertuso spring, requires a special attention to protect catchment area, which is directly affected by the natural hydrogeological budget of the aquifer. Therefore, for the evaluation of vulnerability index and maps COP method was applied considering overlying layers (O), concentration of flow (C) and precipitation regime (P) parameters. The vulnerability of the karst aquifer is classified mainly as moderate, high and very high due to the presence of cemented conglomerates, compact dolomitic limestones and granular limestones, respectively. COP method shows that each factor has a different effect on vulnerability index evaluation, however the highest correlation was observed with O factor due to the absence of soil formations. The results obtained by COP method assess the aquifer vulnerability to contamination and are useful for managing the protection of groundwater resources, especially to avoid contamination of karstic aquifers, and land use planning in the area.

Keywords: vulnerability assessment, COP method, karst aquifer, GIS

PROBABILISTIC MODELS OF MAXIMUM PRECIPITATION

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ABSTRACT

The paper presents the method for model formation to describe the maximum rainfall depth for practical applications. The precipitation models presented in the paper can be a comprehensive solution to the problem of input data for designing and testing the hydraulic capacity of sewer systems in hydrodynamic modeling. For description of precipitation phenomena, the following distributions were used: Gumbel (Maximum Extreme Value Type 1), Fréchet (Maximum Extreme Value Type 2) and Weibull (Maximum Extreme Value Type 3) distribution. The estimates of the parameters of the density function were determined by maximum likelihood method. The probability distributions were evaluated by the Anderson-Darling test, in order to determine the best one.

Keywords: rainfall, probability distribution, maximum extreme value

PROCESS ECOHYDROLOGICAL MODELLING IN BEGA CATCHMENT

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ABSTRACT

Ecohydrology is an integrative science, which is focused on the connections between the aquatic ecosystems and the hydrological cycle (the quantitative and partially qualitative study of waters) and the interactions between them.

In this paper is presented the ecohydrology, as scientifically base to use ecosystem properties, focused on the connections between the aquatic ecosystems and the hydrological cycle. The main purpose of the paper, based on the fundamental concept which says that the water availability is tightly related with the processes which occurs in ecosystems, is represented by the study of the hydrological regime of surface waters, depending on the processes from aquatic ecosystems at the catchments area scale.

Are formulated and developed models for the integrative study hydrology-ecology, the steps for the study, starting from a data base, hydraulic, hydrologic, and biological models. In the end are presented the possibilities to integrate the ecohydrological models into the water resources management plan.

Keywords: biosphere, ecohydrology, ecosystems

QUANTIFICATION OF SUBSTANTIAL SOIL WATER REGIME ELEMENTS DURING IMPORTANT DRY PERIODS

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ABSTRACT

The paper presents the results of quantification of substantial soil water regime elements during important dry periods. Soil water regime elements were monitored on East-Slovakian Lowland in the area surrounding Milhostov station (N 48°39,786'; E 21°43,298'). Daily rainfall measured in Milhostov station during years 1961 to 2013 was analyzed. Based on these data, dry periods were identified by their frequency, duration, distribution in time and probability characteristics. In addition, dry periods were identified while daily rainfall was filtered out during years and vegetation periods. Filtered daily rainfall means that the volume of daily rainfall is zero. Low rainfall, up to cca 5mm, is intercepted by field crops interception capacity from physical point of view. Water is evaporated from plant surface and does not come in contact with soil surface. Development of soil water storage up to 1m depth was quantified on daily basis, as well as development of daily cumulative values of actual evapotranspiration and rainfall in selected dry periods. In addition to this, development of groundwater level under the surface and potential evapotranspiration was analyzed. Numerical simulation on GLOBAL model was used for the purpose of quantification. The results are presented in various works which aim to create methods for forecasting water storage development in 3rd water source (unsaturated soil zone) during periods of meteorological drought.

Keywords: dry period, soil water storage, actual evapotranspiration, drought

RECOVERING COSTS OF DEFENSE AGAINST ACCIDENTAL FLOODING

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ABSTRACT

Accidental floods, occurred due to the failure of flood defence river work systems, must have a specific management, in order to allow reduction of flood negative effects.

The paper presents an important part of a cost – efficiency analyze for the defence linear works against the flooding and the costs recovery established by Water Framework Directive.

To establish relations cost – efficiency is necessary the environmental impact assessment.

It starts from the evidence and determine of the damages until to the establishment, assessment and recovery of the costs.

Keywords: floodplain, cost –efficiency, environmental, nonstructural measures

REHABILITATION OF ASBESTOS CEMENT WATER MAINS FOR POTABLE WATER IN THE CZECH REPUBLIC

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ABSTRACT

In recent history, asbestos cement pressure pipes were widely used for delivery of potable water from water sources to human settlements. Nowadays, most of the asbestos cement water mains are approaching the end of the service life. Although asbestos cement water mains are not considered to represent a significant risk to public health when in normal use, asbestos fibres released into air during rehabilitation of water mains pose a cancer and lung disease hazard. The contribution deals with problems of rehabilitation of asbestos cement water mains in the Czech Republic as well as with safety and disposal issues. The first part of the contribution briefly describes production of asbestos cement pipes and provides information on installation of asbestos cement water mains as second part deals with health effects of asbestos on humans. The final part of the contribution focuses on principal laws and regulations concerned with asbestos waste management in the Czech Republic and safety in the workplace during rehabilitation of asbestos cement water mains.

Keywords: asbestos cement pipe, rehabilitation, water main, health protection, regulations

REMOVAL OF HEAVY METALS FROM WATER BY CERIUM DIOXIDE SORPTION MATERIALS

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ABSTRACT

The objective of this work was to verify the sorption properties of granular filter materials READ-As (hydrous cerium dioxide adsorbent) in removal of heavy metals from water. This material was developed in Japan for removal of arsenic from water. One part of experiments was carried out in ground water source Dúbrava, where a high concentration of antimony in water is caused from mining activities as well as from rain falling on antimony-rich waste rock piles and a sludge-settling pond has led to higher concentrations of antimony in the relevant water resources. At the other part of article are presented results with the same material READ-As for removal of arsenic from ground water source in Jasenie. The values of the bed volume and the adsorption capacity for this sorption material when reaching the limit concentration of antimony and arsenic were determined.

Keywords: drinking water, removal of antimony, removal of arsenic, filtration, cerium dioxide sorption material

REMOVAL OF METALS FROM AQUEOUS SOLUTIONS

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ABSTRACT

The paper studies the efficiency of ash from biomass combustion in the removal of metals from aqueous solutions. Ash from industrial biomass boilers, namely bottom ash and cyclone ash, was used in the laboratory experiment. The selected metals to remove were copper, zinc and manganese. Model metal solutions in the concentration of 100 mg.l^{-1} were prepared. The ash grain size was 1 mm. The experiment observed how the ash acts in the course of metal removal and how the pH value changes. The pH value fluctuated from 5.6 to 10.5. The measured results imply that a reduction in the metal content occurs in the model solution. The efficiency of copper was almost 100%, in zinc it was from 18 to 100% and in manganese it was from 16 to 99%, depending on the type of ash.

Keywords: model solution, copper, zinc, manganese, biomass ash.

**RESEARCH AND OPTIMIZATION A CONE OF A SUCKING AWAY PIPE IN
MICRO HYDROELECTRIC POWER STATION**

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ABSTRACT

Researches were conducted in the given work and optimization cone a sucking away pipe. Transformation of kinetic energy to energy of pressure to a sucking away pipe occurs to losses of some part of energy. On length of a pipe they can be divided into losses on a friction and expansion. The more diffuser pipes, the there is less than loss of kinetic energy, however with increase diffuser increase as hydraulic losses in tap. Losses in a sucking away pipe reduce effect of restoration of energy. Calculations show that losses on a friction make insignificant size, and the cores are losses on the expansion, increasing with corner increase cone, and losses on an exit which size decreases with corner increase cone as the area of target section thus increases.

Keywords: micro hydroelectric power station, diffuser, cone, the optimization, a sucking away pipe.

RESEARCHS ON SYSTEMS OF CROP WITHOUT SOIL

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ABSTRACT

The paper studied new system of agriculture - crop systems without soil. The culture systems without soil can be called also the hydroponic systems and now in Romania are not used only sporadically. In other countries (USA, Japan, the Netherlands, France, UK, Denmark, Israel, Australia, etc.) they represent the modern crop technology, widely applied to vegetables, fruits, fodder, medicinal plants and flowers by the experts in this area. In the world, today there are millions of hectares hydroponics, most of the vegetables, herbs, fruits of supermarkets are coming from the culture systems without soil. The process consists of growing plants in nutrient solutions (not in the ground), resorting to a complex equipment, depending on the specifics of each crop, so that the system can be applied only in the large farms, in the greenhouses, and not in the individual households. These types of culture systems have a number of advantages and disadvantages also. Even if today's culture systems without soil seem to be the most modern and surprising technology applied in plant growth, the principle is very old. Based on him were built The Suspended Gardens of the Semiramis from Babylon, in the seventh century BC, thanks to him, the population from the Peru's highlands cultivates vegetables on surfaces covered with water or mud. The peasant households in China, even today use the millenary techniques of the crops on gravel. This hydroponic agriculture system is a way of followed for Romanian agriculture too, despite its high cost, because it is very productive, ecological, can cover, by products, all market demands and it answer, increasingly, constraints of urban life. The concept of hydroponics agriculture is known and appreciated in Romania also, but more at the theory level.

Keywords: culture, soil, agriculture, hydroponics

SIMULATION OF FLOOD DISCHARGES FOR PURPOSES OF THE ASSESSMENT OF EXTINCT POND AREA TRANSFORMATION POTENTIAL

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ABSTRACT

The possible impacts of climate change have become very often discussed topic among both the scientific and public community. There is strong emphasis put on the mitigation of these impacts which are considered very different involving more frequent floods with higher magnitudes as well as more frequent and longer periods of droughts. The building of new reservoirs could be one of possible ways to deal with this challenge. The landscape in the Czech Republic is facing many pressures caused most of all by urbanization which results in the lack of space for building water reservoirs. The restoration of extinct ponds is considered as a good way to increase the percentage of water bodies in the Czech Republic and therefore it is one of main tasks of the research activities carried out within the project NAZV KUS QJ1220233 “Assessment of former pond systems with aim to achieve sustainable management of water and soil resources in the Czech Republic”.

To assess the possible effect of the restoration, it is necessary to make an analysis on the methodology for testing. In this paper, the hydrologic modelling approach is applied for purposes of the assessment of one extinct pond. The model applied for given purpose is Gridded Surface Subsurface Hydrologic Analysis (GSSHA). The calibration of the model was carried out using the data measured upstream from the study location of former pond at the experimental site of the Department of Irrigation, Drainage and Landscape Engineering. This paper focuses on the assessment of the pond restoration on flood discharges while its effect for drought mitigation is not involved as it needs completely different approach, data and tools.

The results of presented analysis show, that the restoration of extinct pond can affect flood discharges significantly. The influence on flood wave is different for the restoration of pond and maintaining it as water body and for the transformation into the polder. The transformation effect varies with the return period, i.e. with the magnitude and volume of transformed flood wave. Presented results reflect only one case of the outlet object.

Keywords: extinct pond, pond restoration, flood protection, distributed hydrologic modelling.

SPATIAL ARRANGEMENT FLAWS IN RURAL AREAS EVIDENCED BY DISSOLVED ORGANIC MATTER DISTRIBUTION IN GROUNDWATER

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ABSTRACT

The paper presents an evaluation of the influence that spatial planning of village households and utilities has over the groundwater used as drinking water source. Water samples collected from wells in a rural area in Romania were analyzed using fluorescence spectroscopy and the cadmium reduction method for nitrates. The spatial distribution of dissolved organic matter (DOM) and nitrates in the groundwater was created, in order to understand the role of local planning in the quality of groundwater. Spectroscopic ratios, derived from the fluorescence data, evidenced high concentration of microbial DOM as a cause of nearby sheepfolds and poor management of domestic/animal wastes. Nitrates concentration exceeded the maximum admitted limit in some wells due to soil infiltration from agricultural practices and animal wastes. The study has shown that groundwater is negatively influenced by animal sheds, the local cemetery and natural pools, whose effect is amplified by the area's geomorphological features. The employed methods offer a rapid and sensitive evaluation of water quality in order to avoid health hazards for the population.

Keywords: groundwater, fluorescence, spatial distribution, dissolved organic matter

STAGE FREQUENCY ANALYSIS ON THE GREAT PRESPA LAKE

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ABSTRACT

The article presents an analysis of maximum annual water stages on the Great Prespa Lake at Gauge Station Stenje. To better scientific approach was necessary to obtain 60 hydrologic years of maximum annual water levels in cm (1951-2010). The best fitting distribution was Pearson distribution type 3 according to Kolmogorov-Smirnov test, after defining the low threshold outlier in annual maximum lake level time series. For analyzing of maximum annual water levels was taken General frequency analysis with Stage frequency analysis in analytical (Pearson type III distribution) and graphical option (User defined graphical curve) in the software HEC-SSP 2.0. According to natural pluvial conditions, the Prespa Lake is one of the biggest fresh water objects in the Balkan Peninsula, so its flood regime importance for nature and humanity is great.

Keywords: Maximum annual stage, probability distribution, tests, return period.

STATUS OF WATER QUALITY IN CUEJDI HYDROGRAPHIC BASIN FROM EASTERN CARPATHIAN, ROMANIA

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ABSTRACT

Cuejdi River drains a surface of 97.41 km² in the south-eastern area of the Stanisoarei Mountains (Eastern Carpathians). The length of the main water course is 29.11 km, having its spring at the altitude of 970 m being a left tributary of the Bistrita River with the output in the Piatra Neamt City center. In the superior basin in the summer of 1991, following extensive landslides which blocked the Cuejdi River valley, the largest natural dam lake in Romania was formed, Cuejdel Lake. These water resources are well known for their excellent quality but lately due to increasing anthropic pressure, the quality decreased significantly. This paper seeks to prove the human interference in the state of the Cuejdi hydrographic basin using the Water Quality Index (WQI).

Water quality status assessment can be defined as the evaluation of physical, chemical, biological state of the water in relation with the natural state, anthropogenic effects and future uses. WQI provides a single value expressing the average quality of water at a time, based on analytical values of physic - chemical parameters. In computing the WQI were used five physic - chemical parameters: pH, dissolved oxygen (DO), biochemical oxygen demand (BOD₅), nitrate (NO₃) and phosphate (PO₄). WQI is a 100 point scale that summarizes results from different measurements that can be divided into several ranges corresponding to quality classes, 100 being the highest score.

The measurements include - 30 sampling points from the middle and inferior sectors of the river and 12 from the superior basin - Cuejdel Lake. Using WQI allowed the comparison of the two aquatic environments, differences in their quality being noticed.

In the Cuejdel lake catchment as there are little anthropic influences and impacted mostly by natural environmental variables, the water quality is good with an average index of 86. Based on the WQI values the results revealed a classification of the river in three main quality sectors. The first one is the sector between the confluence of Cuejdi with Tiganca creek with a an index of 75 followed by the sector between Cuejdi and Gârcina villages, with a lower WQI of 66.5 as the river is influenced by both natural and anthropic variables. The last one Piatra Neamt - Garcina river sector is intensively affected by human activities (river crosses the city) having a lower quality with an average index of 58.

This distribution of WQI along the Cuejdi hydrographic system basin proves that there is a decrease in quality due to the environmental impacts of human activities. The use of this index as a communication tool can be extremely useful for all authorities involved in water management resources.

Keywords: Water Quality Index, Cuejdi hydrographic basin, Cuejdel Lake, anthropic influence.

STUDY OF FLOOD WAVE PROPAGATION WITH HYDROINFORMATIC TOOLS

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ABSTRACT

Water Framework Directive 2000/60/CE and Flood Directive 2007/60/CE establish the need for preparation of flood risk maps for each member country on each important hydrographic basins. Flood Directive requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. This Directive shall be carried out in coordination with the Water Framework Directive, the flood risk management plans and river basin management plans must to be coordinated. To prepare flood risk maps need flood wave propagation study using hydroinformatic tools. In the last decades have taken a emergence of numerical tools for calculations, simulation and to the mapping in the domain of hydrodynamics, thanks to the computer technologies, the evolution of the programming languages and fast increment of processing speed.

This paper presents the mathematical basis of two flood wave propagation simulation models, DUFLOW and MIKE11, and the comparison of these. The first model, DUFLOW, is a one-dimensional program for quantitative and qualitative modeling of water movement in open channels. The numerical methods offer multiple possibilities related to the most complex and difficult problems of research, developed in physics of hydraulic phenomena's. The numerical calculus permit the knowledge of physical phenomena's with sufficient accuracy, so most times, checking on laboratory models is no longer necessary. The second model, MIKE11, is a professional engineering software package for simulation of one-dimensional flows in estuaries, rivers, irrigation systems, channels and other water bodies. MIKE 11 is a 1-dimensional river model. The MIKE 11 is an implicit finite difference model for one dimensional unsteady flow computation and can be applied to looped networks and quasi-two dimensional flow simulation on floodplains. The model has been designed to perform detailed modeling of rivers, including special treatment of floodplains, road overtopping, culverts, gate openings and weirs. MIKE 11 is capable of using kinematic, diffusive or fully dynamic, vertically integrated mass and momentum equations.

The paper contains also a case study, i.e. a flood wave propagation study for Crasna River, situated in north-western Romania, with the two hydroinformatic tools (DUFLOW and MIKE11) and results comparison.

Keywords: flood wave, propagation, floods, hydroinformatic tools.

**STUDY OF THE UNSTEADY WATER FLOW IN SALSIG-MARAMURES
CATCHMENT PIPES NETWORK AND ULIUC HEADRACE PAPER**

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Lect. Serban V. Nicoara

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ABSTRACT

The paper presents a numerical simulation of the unsteady water flow through the pipes network of Salsig-Maramures Catchment Line and Uliuc Headrace supplying with fresh water the Town of Cehu Silvaniei, Salaj County, corresponding to a reasonable running situation. The resented hydraulic study is based on specific data regarding the network geometry, the topographic and hydro-geology situation of the catchment area, the technical information describing the six drillings (F5, F7, F8, F9, F10 and F11) in the flood plain of Somes River at the confluence with Salaj Creek, and the path topography along which the headrace to the Uliuc reservoir lays down, respectively. A daily water demand distribution is assumed (the hourly variation ratios for the increased consumption interval considered from 0.51 to 1.37), which leads to a maximum water flow reached in the network of 1.64 m³/min. The hourly water volume required for the supply system is stored up by the Uliuc reservoir placed about 12000m from the catchment line. The Salsig-Maramures Catchment is represented by 9 drillings endowed with 9 pumps of variable rotation speed. The performed simulation considers as running simultaneously a group of 6 out of the 9 pumps (situation corresponding to “option O3” – situation employing the F5, F7, F8, F9, F10 and F11 combination of drillings). Several relative rotation speed values are considered in such a way that the working parameters of the running system to be optimized.

Keywords: Groundwater modelling, pipes, drillings discharges

**STUDY ON A STEADY STATE GROUNDWATER MOTION
CORRESPONDING TO THE SALSIG MARAMURES CATCHMENT AREA**

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ABSTRACT

The numerical modeling of several possible working procedures regarding the ground water flow towards the drillings F3- F11 of Salsig-Maramures catchment area in Somes River flood plain is presented in the present paper. A 2D finite elements numerical modeling was considered in order to simulate the possible operation procedures that would lead to the working water levels (elevation levels or dislevelments - s) on the catchment drillings and to the operation flow - Q_{exp} , respectively. The catchment front supplies the Town of Cehu Silvaniei of about 7200 inhabitants, Salaj County, with fresh water. The numerical simulation of the steady state groundwater flow considers a maximum catchment discharge of 20.00 l/s, covering specific running situations composed from 6 out of 9 drillings working at a time. In case of an unfavorable situation given by the groundwater level variation in Salsig Catchment area, are three running options that are going to ensure the demanded discharge for fresh water supply of Cehu Silvaniei Town

Keywords: groundwater modeling, drillings flow, 2D hydrodynamic modelling

**STUDY ON HYDROBIOLOGY AND PHYSICO-CHEMICAL PARAMETERS
OF LAKE ILMENSKOE, ILMENSKY RESERVE, RUSSIA**

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ABSTRACT

The present work deals with water quality parameters and hydrobiology of Lake Ilmenskoe which is located at Ilmensky Reserve, Russia. We studied the physico-chemical parameters (water and air temperature, pH, conductivity, dissolved oxygen and carbon dioxide, nitrates, nitrites, ammonia, phosphates, chlorides, bicarbonates, calcium, magnesium and organic matter) and phytoplankton in June-July during 2006 – 2012. A total of 68 taxa belonging to 7 divisions have been identified, including Bacillariophyta (28% of taxa), Chlorophyta (28%), Cyanophyta (27%), Euglenophyta (9%), Dinophyta (4%), Chrynosophita (3%), and Xanthophyta (1%). The 13 species of Mollusca and 9 species of Macrophytes were also observed. The values of the physico-chemical parameters of water and taxonomic resolution obtained in the study sites indicate the mezotrophic status of the lake.

Keywords: Lake, Physico-Chemical Parameters, Phytoplankton, Taxonomy, Macrophytes

SURFACE WATER QUALITY IN BISTRITA RIVER BASIN (EASTERN CARPATHIANS)

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ABSTRACT

The Bistrita River holds a high hydro power potential and, in time, suffered different anthropogenic influences, both in terms of the modification of the drain (because of the hydro-energetic development) and in terms of water quality (because of the development of the riparian agglomerations and the industrial complexes). The Bistrita River represents a significant source of water supply for some important economical operators in Piatra Neamt, Roznov, Buhusi and Bacau. For Piatra Neamt the Bistrita River also has potable purposes. The flow rates of the river have been systematically monitored both from a quantitative and a qualitative point of view, for all the parameters, in accordance with the Framework Directive 60/2000/EEC. This paper presents a study on the evolution of only few physical and chemical parameters, which influence the quality of the Bistrita River, such as: pH, dissolved oxygen, CBO5, CCO-Mn, CCO-Cr, ammonium, nitrites, nitrates and total iron. After many studies and researches, the conclusion is that for all the parameters on the upstream sector, the waters of the Bistrita River can be included into the good quality class (the Ist class of quality). In the lower and downstream sectors the water is included in the moderate class because the parameters suffer some quality changes. That is, in the lower sector, namely in the sector downstream the industrial platform of Bacau, the Bistrita River waters have been influenced by a number of economical operators that produce chemical fertilizers or paper. Currently these sources of pollution are closed or under conservation (LETEA Bacau Paper Factory). The period under review reveals a significant reduction of the pollutants discharged along the Bistrita River. After the Siret Water Basin Administration imposed some emergency measures, the main economical agents and the human agglomerations bordering the Bistrita River have made important investments for the development of new waste water treatment plants particularly in the agglomerations Bicaz, Piatra Neamt and Bacau. Due to these measures, the pollutant flow specific to the economical agents and the water waste, were greatly diminished. Therefore only a few small sections of the Bistrita River are included in the moderate class, the rest are included in the good quality class (the Ist class of quality).

Keywords: Hydro-technical constructions, anthropogenic influences, physical and chemical parameters, pollution

TECHNICAL SOLUTIONS FOR ENSURING FISH MIGRATION UPSTREAM AND DOWNSTREAM THE ORADEA POWER PLANT DAM

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ABSTRACT

This paper responds the WFD 2000/60 provisions related to the rivers longitudinal connectivity and to increasing public interest regarding the sustainable development of river systems, especially for the heavy modified water bodies.

The aim of this work was to propose technical solutions for ensuring fish migration upstream and downstream the CET1 Oradea weir dam, placed on the River Crișul Repede.

The aim of this work is to present a solution to facilitate fish migration, by proposing technical solutions that intend creation of fish pass in order to help the migratory species present in study area, to migrate upstream and downstream the CET1 Oradea dam.

All components of the proposed fish pass system (mobile basins, flexible plastic tubes, transportation systems, etc.) are designed to transport fish up- and downstream the dam, being placed on the second and third dam's piles.

Taking into account the local specific conditions and technical characteristics of the placement, the proposed system can be successfully used at other dams of this type, that offers to the proposed solution a practical value.

Keywords: dam, longitudinal connectivity, fish migration, Crișul Repede

**TERRAIN MEASUREMENTS AND CALIBRATION OF HYDRO
DYNAMICAL MODEL OF THE WATER WORK DRAHOVCE - MADUNICE**

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ABSTRACT

The simplest part of Vah hydroelectric system from the point of view of mathematical modelling is the water work Drahovce - Madunice. Modelling methods verified on other channel hydro power plants are easily applicable on this hydroelectric system. Last year was made by our department terrain measurements and research on this water work. The results of measurements were used for the better calibration of hydro dynamical model of this water work. The presented paper describes this process.

Keywords: hydropower plant, water work Madunice, hydraulic parameters, terrain measurements

**THE ANALYSIS OF THE RECESSON HYDROGRAPH'S LIMBS ON THE
CHOSEN WATERSHED IN THE CZECH REPUBLIC**

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ABSTRACT

The analysis of the recession hydrograph's limbs is based on the evaluation of the recession characteristics estimated from the runoff hydrograph on the selected catchment in the Czech Republic. Within this contribution the following constitutional storage discharge relationships of single accumulation space were identified: the linear, the nonlinear and the exponential reservoir. The recession limbs analysis consists of two parts. The first part explores the parameter estimation using the local optimization algorithm based on nonlinear least squares minimization, it was applied for the identification of power relationship of nonlinear reservoir. In the second part of the analysis the parameters of studied constitutive relationships are estimated using global optimization algorithm based on the Shuffled Complex Differential Evolution (SCDE). The main result of calibration is the finding that the baseflow response of basin corresponds more to the response of nonlinear reservoir on tested set of watershed.

Keywords: baseflow, recession limb, constitutional relationship, models of reservoir, optimization algorithm

THE APPLICATION OF FUZZY LOGIC TECHNIQUES TO THE CHARACTERISATION OF TREATMENT SYSTEMS IN TWO SEWAGE PLANTS

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ABSTRACT

The alternatives for treating urban waste water are many and very varied. The choice depends not only on the characteristics of the water to be treated, but also on other factors such as the size of the town it serves, the economics, environmental factors, etc.

While many works have dealt with the subject of the treatment of waste water from small towns, various industrial processes or inflow from towns with a large industrial load, not many have carried out comparative studies of various types of Waste Water Treatment Plants (WWTPs) in towns with inflows which are predominantly domestic using statistical processes.

This work aims to carry out a study, using Fuzzy Logic, of the various analytical parameters analysed in the water at the inlet (inflow) and at the outlet (outflow) of two different WWTPs which receive domestic contributions, once the water has undergone purification treatment. Two waste water treatment plants serving different towns in the province of Valencia (Spain) and which treat the inflowing waters using different purification systems were selected for this. The Utiel WWTP treats the waters using activated sludge and a prolonged aeration process with a “two-stage” purifier, while the Cheste plant uses a treatment involving bacteria beds with trickling filters.

An analytical series is available from these WWTPs covering some 10 years with a frequency of two weeks. The parameters available, at the inlet and the outlet, are: rain (Lluv), daily input volume (Vold), pH, conductivity (Cond), Solids in Suspension (SS), DBO₅, DQO, total Nitrogen (Nt), total Phosphorus (Pt) and a sampling period expressed in months.

The PreFuRGe (Predictive Fuzzy Rules Generator) tool was used to process the data, allowing us to obtain an immediate qualitative analysis of the information contained in the resulting volume of data. Thus, dependency relationships were established between the parameters, not numerically, but logically, by also analysing the various times of the year with the various parameters to establish a probable seasonality.

Keywords: Sewage plant; fuzzy logic; activated sludge; bacteria beds.

(Cond), Solids in Suspension (SS), DBO₅, DQO, total Nitrogen (Nt), total Phosphorus (Pt) and a sampling period expressed in months.

The analytical methods used to determine the variables relating to the waste water in the WWTPs follow the procedures established by the American Public Health Association A.P.H.A. in 1999.

RESULTS AND DISCUSSION.

Figures 2 to 7 show the fuzzy rules obtained from the mass of data from the Utiel and Cheste plants, describing the behaviour of the variables in the study. The physico-chemical variables were modelled both at the inlet (E) and at the outlet (S) of the treatment system (e.g. pH Eu, pH S,...).

UTIEL Plant.

The DBO₅ and DQO at the outlet of the system present practically identical behaviour if they are taken as consequents, why is why only the figure in which DBO₅ is shown as the consequent has been represented (Fig. 2). DBO₅ takes its highest values when the rain takes values from low to extreme-low, while DQO takes its highest values when there is no precipitation and the volumes contributed are at their lowest. This is a consequence of having a single sewerage network for both waste water and rainwater. However, the fact that there is a spillway which diverts the excess that is produced at times of intense rainfall means that the WWTP's waste water intake capacity produces an undeniable dampening effect on these results, despite the fact that they continue to be very clear.

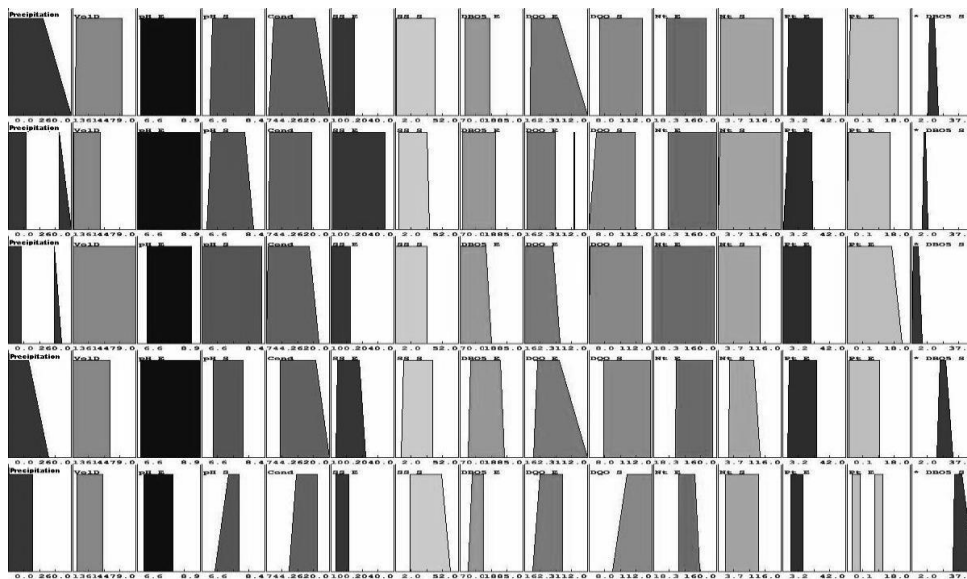


Fig. 2. Fuzzy rules taking DBO₅ S as the consequent and the rest of the variables at the Utiel plant as the antecedent.

When DBO₅ and DQO present extreme-high values in the outflow, the other variables measured also present more concentrated values than the rest at the outlet. Specifically, it is worth pointing out that pH has medium values, Nitrogen between low and medium, and phosphorus very specific low or medium values.

The relationship between DBO₅ S and solids in suspension at the outlet is observed to be such that the latter remain at low to minimum values at all values of DBO₅, except at their maximum, when the solids shift to higher values.

At the outlet nitrogen behaves as follows: with DBO₅ S values from low to medium, nitrogen can take any value. At the same time, when DBO₅ S values are at their lowest, nitrogen takes values from medium-high to extreme-low, and when DBO₅ S rises above average values, nitrogen appears contained within low ranges.

At the outlet phosphorus and pH function in a very similar way to nitrogen at the outlet.

If we consider the Pt at the outlet the consequent (Fig. 3), the fact that Pt S values do not present any apparent relationship with the time of year stands out, with the clear exception of the months of April to June, in which Pt takes the highest values.

It is in this scenario of maximum Pt S, that the clearest definition of the ranges taken by all the variables considered in their respective universes of discourse is produced, with all of them having limited very concentrated groupings around a point. Thus, this maximum value for Pt corresponds to very concentrated and extreme-low values for solids at the inlet and the outlet, and for rain that is non-existent. The volume treated, pH at the outlet, conductivity, N at the outlet and DBO₅ and DQO also take very concentrated values in the low and medium-low ranges, with no variable being found in this study with high or extreme-high values. Consequently, it must be admitted that the process of eliminating phosphorus in the Utiel WWTP is hindered in spring, coinciding with the absence of precipitation, with a low volume of waste water, a very low quantity of solids in suspension and with very low DBO₅ and DQO, all relating to the inflow. The explanation may be found in the fact that the elimination of insoluble phosphorus by means of decanting is hindered by the lower concentration of solids in suspension and therefore the lower level of decanting. Furthermore, low temperatures obstruct the biological elimination of compounds of phosphorus, so that in winter a larger quantity of iron chloride is added, with it being spring when the dosage is reduced. If the spring is cold, the elimination of nitrogen is even lower. Note that in the Pt Eu dupele the value is medium for this situation.

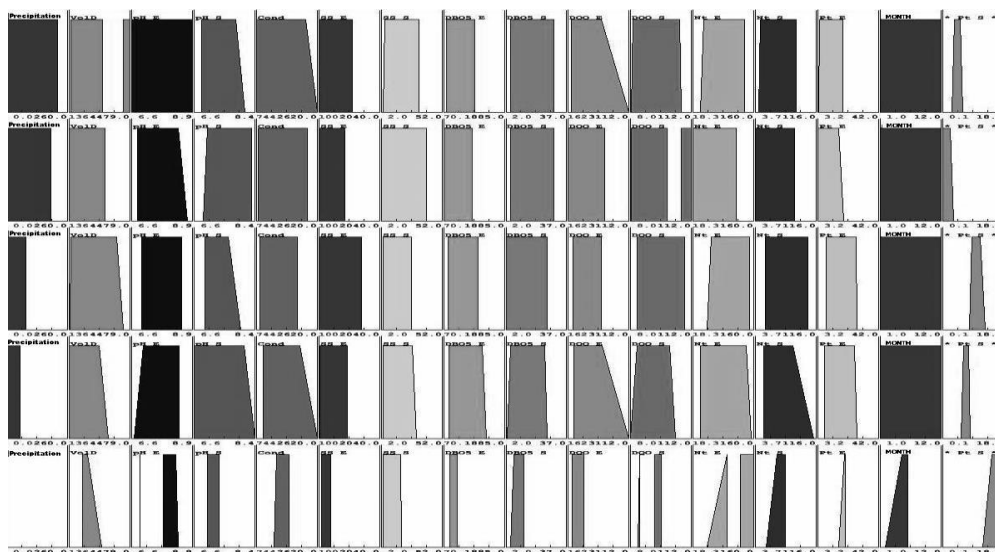


Fig. 3. Fuzzy rules taking Pt S as the consequent and the rest of the variables at the Utiel plant as the antecedent.

The graphic which deals with Nt at the outlet (Fig. 4) as a consequent is not significant, although it should be pointed out that the highest Nt values at the outlet correspond to the highest DBO₅ values at the system inlet, which co-exist with pH values in concentrated ranges from low to medium and rainfall from low to extreme-low. Although with a much lower degree of precision in the tuples, it can be considered that the behaviour of the high concentrations of Nt and Pt in the outflow display a certain similarity. In fact, in both cases periods of very low or no rainfall, concentrations of solids in suspension from medium to very low and very low at the inlet, and DQO from medium to very low and very low at the inlet all coincide.

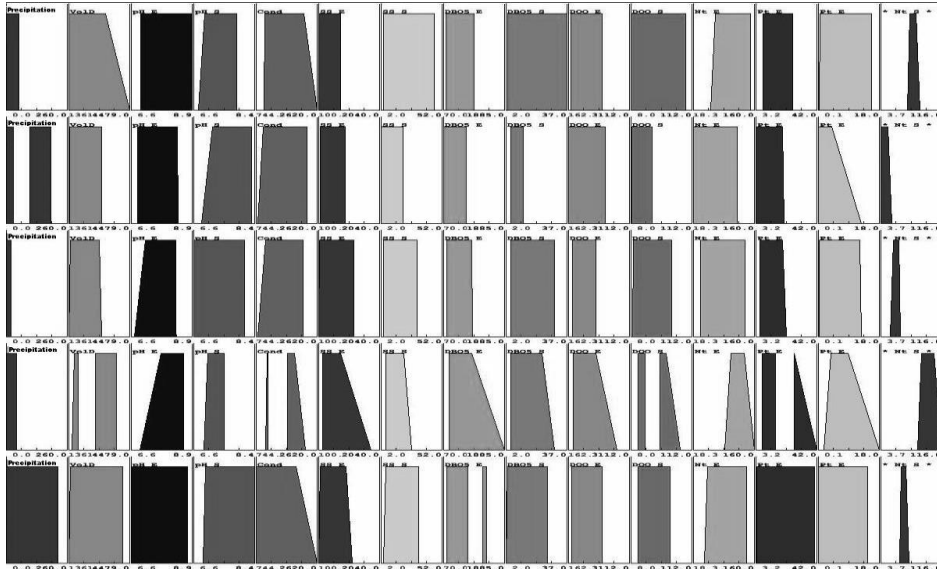


Fig. 4. Fuzzy rules taking Nt S as the consequent and the rest of the variables at the Utiel plant as the antecedent.

CHESTE Plant.

DBO₅ and DQO at the outlet present similar behaviour if taken as consequents, which is why only the figure in which DBO₅ is shown as consequent (Fig. 5) has been included. In general, it is observed that values from extreme-low to medium for DBO₅ correspond to wide ranges for the rest of the variables, which can take very dispersed values. Conversely, when DBO₅ takes its highest values, all the variables take very specific values in very clearly defined ranges within their universe of discourse. Thus, the maximum DBO₅ values occur when the variables daily Volume, solids in suspension at the inlet, DBO₅ outlet, DBO₅ inlet, Nt outlet, Pt at the inlet and the outlet take very clearly defined values in ranges from low to extreme-low.

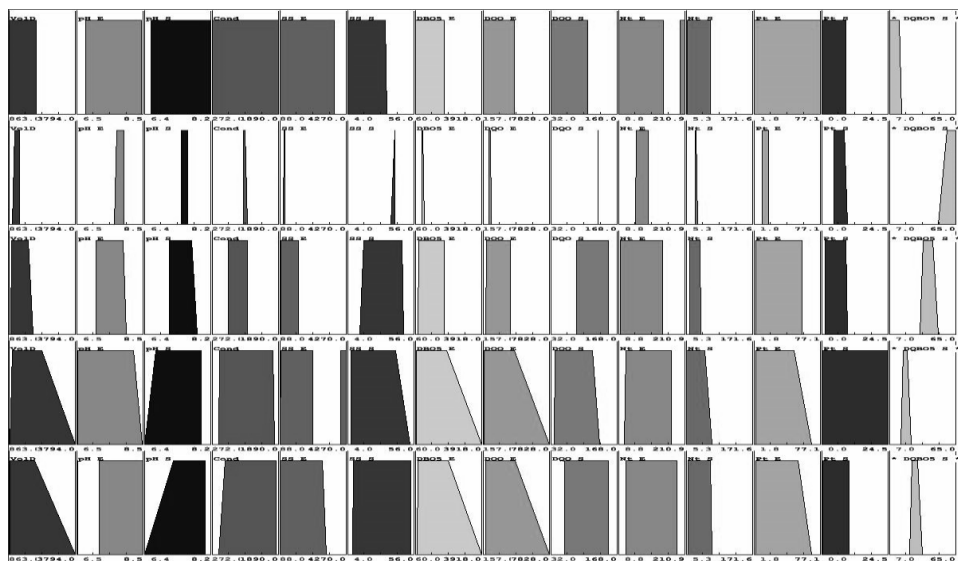


Fig. 5. Fuzzy rules taking DBO₅ S as the consequent and the rest of the variables at the Cheste plant as the antecedent.

Taking Pt at the outlet as consequent and the other parameters as antecedents (Fig. 6), it is also observed in this treatment plant, just as in Utiel, that for the highest Pt values at the outlet, the values for the other variables are found to be more concentrated, although no very significant relationship is observed between the evolution of the concentration of P at the outlet of the plant, and the consequent evolution of the values in the rest of the variables. In general pH values stay close to the maximum, except when the values for PT S are low, when pH can have any value. As for DBO₅ Eu, DQO Eu and Nt S, the values for these remain constantly low, regardless of the Pt S value while DBO₅ S, DQO S and Nt Eu keep quite dispersed values.

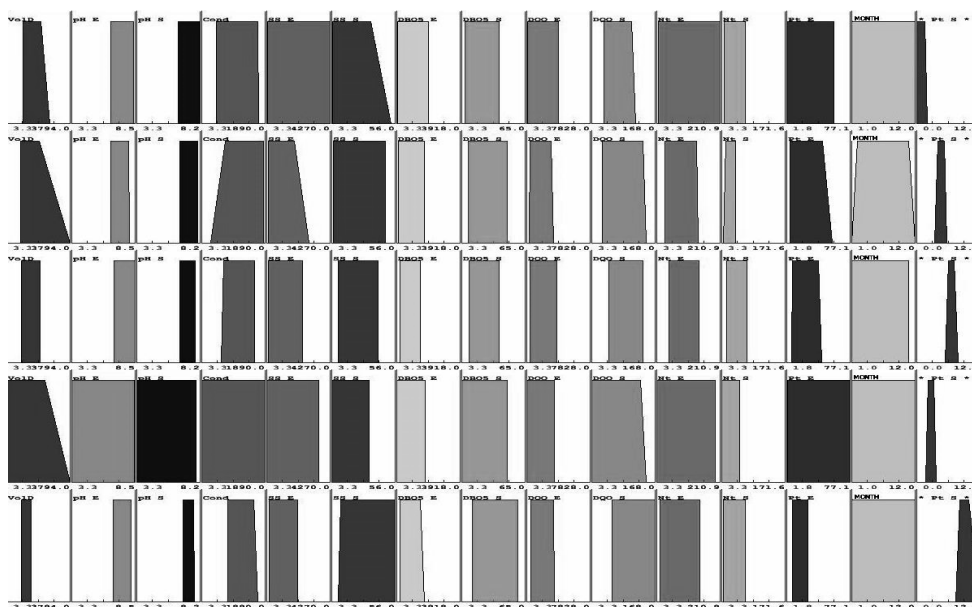


Fig. 6. Fuzzy rules taking Pt S as the consequent and the rest of the variables at the Cheste plant as the antecedent.

As described in the case of PtS, when Nt at the outlet is considered the consequent (Fig. 7), it is observed that, when the latter is at its highest, the other variables are found to be

more concentrated around a value for almost all the low or extreme-low cases, except conductivity and N Eu, which take medium-high values. However, in this case, and unlike Pt S, pH, both at the inlet and the outlet, is always kept at extreme-low values, whatever the Nt value at the plant outlet.

In the other scenarios, no consequence is noticed in the values of the other parameters with the evolution of Nt at the outlet.

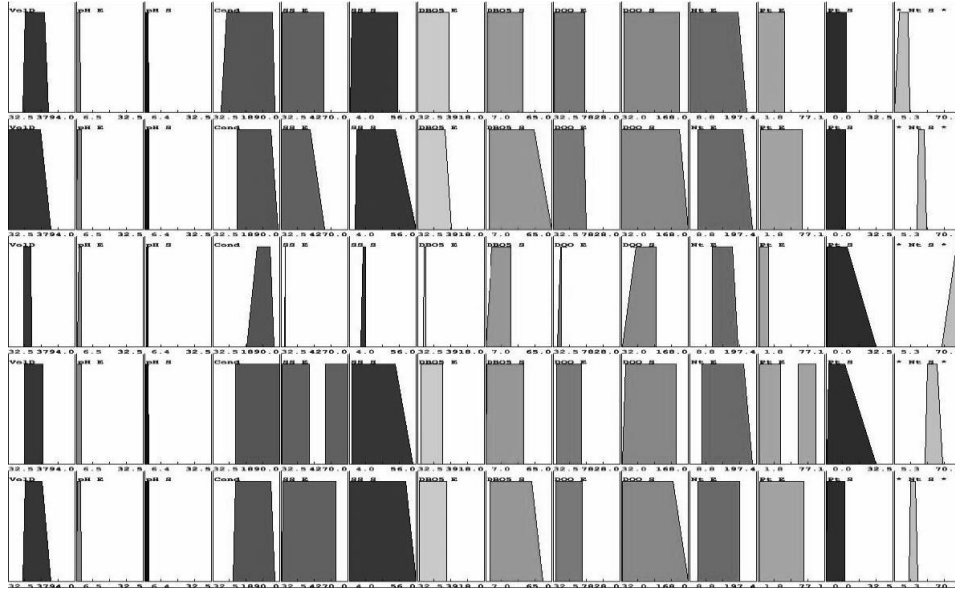


Fig. 7. Fuzzy rules taking Nt S as the consequent and the rest of the variables at the Cheste plant as the antecedent.

CONCLUSIONS

Differences in behaviour can be observed between the Utiel and Cheste plants, marked by the different purification methods used in each

When DBO5 and DQO are extreme-high at the outlet (i.e. the treatment process has worked more inefficiently and the water sample at the outlet from the plant is therefore more polluting), the values for the rest of the parameters are more concentrated around a value, with the low or very low values for phosphorus and nitrogen at the outlet standing out. This means that it is when the values of N and P are successfully reduced that the demand for oxygen at the outlet has been reduced less. Conversely, when DBO5 and DQO are very low, the values for P and N at the outlet are found to be quite dispersed. In terms of DBO5 at the outlet in Utiel, its relationship with SS, also at the outlet, must be pointed out; for any value of DBO5 the values of the latter remain low, except when DBO5 is at its maximum, which is when SS at the outlet increase. In this regard, it is worth pointing out that solids in suspension are eliminated in the decanting process, which, in practice, is independent of the biological process of activated sludge and, probably, when DBO5 is at its maximum, when it was necessary to recirculate a greater quantity of sludge (solids) to attempt to improve the process.

The value of Phosphorus is extreme-high at the outlet of both plants that a greater concentration is evident in the tuples of the rest (more significant in Utiel). No relationship is observed between the evolution of the concentration of phosphorus and the other parameters in Cheste, a fact which is, however, evident in the case of Utiel, where extreme-high values for phosphorus coexist with an absence of rainfall, extreme-

low values for SS at the inlet and outlet, low or medium-low values for pH S, conductivity, N S, DBO5 Eu, DBO5 S and DQO Eu, while no parameter is found at high or extreme-high values.

These results provided by the PreFuRGe tool allow us to conclude that in the case of a treatment plant which uses activated sludge processes in a two-stage system, in order to prevent phosphorus reaching maximum concentrations, the action that needs to be taken to modify the outlet parameters must be considered in the treatment plant by means of the appropriate treatment, since no action can be taken to modify the inlet parameters. It must also be borne in mind that, in practice, a high proportion of DQO Eu and consequently also of DBO5 Eu, in relation to PtEu, is positive for the elimination of phosphorus, especially if the former have undergone a process of anaerobic degradation while being transported through drains and the sewerage system. In fact, a DBO5 Eu soluble/Pt Eu soluble ratio that is greater than 15 favours a reduction in phosphorus, and increasingly as this ratio rises. As can be seen, both in Cheste and, especially in Utiel, in those cases in which the antecedent is Phosphorus at the outlet, the maximum values for Pt S coincide with the minimum values for DQO Eu and DBO5 Eu, which corroborates what has been said and reveals the usefulness of the fuzzy logic tool.

It remains clear, therefore, that the precipitation and the composition of the inflow water, which in turn is regulated by the presence or otherwise of wine-producing industry, with seasonal action caused by the wine-making process, translate, finally, into values for P and N which are clearly affected by the factor of dilution and are contrastable with those tuples with values taken mainly by pH, DBO5 and DQO and, to a lesser extent, the other variables.

Finally, in relation to the Nitrogen in the outflow, and only in the case of very high values for this pollutant, the PreFuRGe tool indicates that these values occur when pH presents low values in both treatment plants and, in the case of Utiel, when DBO5 presents maximum values.

REFERENCES

- [1] Aroba, J., 2003. Avances en la toma de decisiones en proyectos de desarrollo de software PhD Thesis, University of Sevilla.
- [2] Aroba, J., Grande, J. A., Andujar, J. M., de la Torre, M. L., Riquelme, J. C., 2007. Application of fuzzy logic and data mining techniques as tools for qualitative interpretation of acid mine drainage processes. *Environ. Geol.* 53, 135–145.
- [3] Grande, J.A., Andújar, J.M., Aroba, J., de la Torre, M.L., 2010. Presence of As in the fluvialnetwork due to AMD processes in the Riotinto mining area (SW Spain): a fuzzy logic qualitative model. *Journal of Hazardous Materials.* 176, 395-401.
- [4] Jiménez, A., Aroba, J., de la Torre, M.L., Andujar, J.M., Grande, J.A., 2009. Model of behaviour of conductivity versus pH in acid mine drainage water, based on fuzzy logic and data mining techniques. *Journal of Hydroinformatics*, 11, 147-153.
- [5] Valente T., Leal Gomes, C., 2009. Fuzzy modelling of acid mine drainage environments using geochemical, ecological and mineralogical indicators. *Environmental Geology* 57, 653-663.

THE ASSESSMENT OF MICROBIOLOGICAL WATER QUALITY OF DRINO AND VJOSA RIVERS, ALBANIA

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ABSTRACT

The necessity of environmental protection, public health and tourism development is today one of the main priorities in Albania. Even though our country is very rich with water resources due to wide river nets and mountains direction from east to west, their microbiological water quality has been long discussed. Drino and Vjosa are the main rivers in the southern region of Albania and they are shared between Greece and Albania. In Albania, they are under the influence of anthropogenic pollution, which is connected to the untreated urban discharges, waste effluents, agricultural activities etc. The aim of this study is to assess the microbiological water quality of these rivers in Albania based on the seasonal changes of bacterial parameters. Samples are collected every season from Summer 2012 until Winter 2013 - 2014. Seven sampling stations are established along Drino and Vjosa Rivers for this study. Two of these stations are located in the border points, where the rivers come from Greece to Albania. This is done to study whether the water is contaminated in Greece or it is polluted in Albania. The microbiological examination of water samples is made to determine the quantity of *Faecal coliforms* and *Faecal streptococci* as indicators of fecal pollution. These indicators are detected via Multiple -Tube Fermentation Technique or Most Probable Numbers (MPN) technique. According to preliminary results, there is a high load of Fc (until 1.2×10^7 bacteria/100ml) and Fs (until 2.3×10^4 bacteria/100ml) in water of five sampling stations, above the rates allowed by European Union for surface waters. While the microbiological quality of water in two stations near the border with Greece is within the rates allowed. The human impact on the microbiological water quality of Drino and Vjosa rivers is more than evident. We will notice that this situation will continue to worsen for as long as urban emissions of all kinds are not handled. Uncontrolled use of such waters could have serious environmental and public health implications especially when water is used for agricultural purposes, aquaculture, swimming etc.

Keywords: Faecal coliforms, Faecal streptococci, microbiological water quality, rivers.

**THE DISTRIBUTION OF SALT MASSIFS AND THE EXPLOITATION OF
ANCIENT AND CURRENT RESERVES OF MINERALIZED WATERS
WITHIN THE SIRET HYDROGRAPHICAL BASIN (ROMANIA) – CASE
STUDY FOR THE EASTERN AREA OF THE EASTERN CARPATHIANS**

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ABSTRACT

The present study proposed to underline the importance of salt-water reserves in the life of the local communities and to quantify the value of certain basic elements that can affect their chemical properties. The salinity does not produce pollution, but only a restriction of water use in certain domains. There is a close connection between the genesis of salt reserves and the emergence of springs, the type of rock, the regional and local climatic regime, the type of hydrographical network supply, and the liquid discharge. The waters within the Carpathian mountainous and sub-mountainous area can be influenced directly by the emergence of salt deposits on the surface. The poorest springs are situated in the area of the Moldavian Subcarpathians, where there are diapiric outcrops. The Neolithic settlements in the east of the Eastern Carpathians attest the oldest use of salt springs in the world. Some springs may be underlined by the humans through animals, mostly the sheep, which looked for salinized fields for their optimal water intake. The salt-water springs are used on a local scale; in this sense, there is a traditional popular management (ethnomanagement). There are numerous ancient and current settlements which have occupied the salinized areas for the exploitation and commercialisation of mineralized waters or of salt in its native state.

Keywords: ethnoarchaeology, ethnomanagement, salt springs, salt deposits, Romania, salinity.

**THE HISTORIC FLOOD ON THE RIVER LĂPUȘ (TRANSYLVANIA,
ROMANIA) - GENESIS, THE FEATURES AND EFFECTS IN THE TERRITORY**

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ABSTRACT

Lăpuș River is the most representative local watercourse in Transylvania, for the extreme hydrological events and negative effects induced in the territory. Its basin covers an area of about 1875 km². This study is focusing on the synthetic analysis of Lăpuș basin historical flood (March 3-6, 2001) with special regard on all phases of the risk generator event. Thus, we have evaluated the genesis flood conditions (thick layer of snow - 50 cm, liquid precipitations between 75 and 193 mm accumulated in three days, air positive temperatures, drainage and hydraulic favourable conditions). Also have been considered the characteristic elements of the flood (high flow period, double pulse flood wave, discharge flow and historical volume, the exceeding time intervals for the threshold defence levels monitored at gauging stations) and special effects in the territory (massive infrastructure damages, fortunately without casualties). At the end of the study was developed an integrated map that quantifies the effects of extreme flood and vulnerable areas associated with potential structural measures in order to mitigate future floods.

Keywords: floods, maximum discharge, threshold levels, Lăpuș River

**THE HUMAN IMPACT ON THE NATURAL ENVIRONMENT:
ELEMENTAL GEOCHEMISTRY OF A MSW LANDFILL AS A TOOL TO
TRACE CHANGES IN ECOSYSTEM PROCESSES**

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ABSTRACT

In Italy landfills are the most common method of organized solid waste disposal as it is simplest and cheapest one. About 60% of total waste produced is disposed in landfills. Landfills continue to serve a key function in the waste management system in the less developed countries, although the general trend is to minimize the use of them by new policies of reducing, reusing, recycling, and the development of technologies for composting and residues incineration. The aim of this study is to assess the impact of a MSW on the environment using some simple geochemical tools as tracer of anthropogenic contamination in the environments surrounding a municipal solid waste (MSW) landfill. The landfill studied here is located in central Italy and it has been working since 1995. It's divided in 3 lots, and it has a capacity more than 2,000,000 cubic meters. The geology of the area is characterized by a Plio-Pleistocene substrate of marine origin formed at the base by clayey-sandy deposits that in the upper part of the formation to pass sands and conglomerates. The oldest deposits are represented by gray-blue clays. The aim of this study is to identify the cause(s) of changes in downgrading groundwater quality. To assess the possible impact of the landfill on the environment the groundwater chemical composition (physicochemical parameters, major constituents and trace elements) of 13 wells was taken into account. The wells are located hydraulically downgradient of the site. The results are compared to both background and baseline groundwater quality. The aim of this study is to assess the impact of a MSW on the environment using some simple geochemical tools as tracer of anthropogenic contamination.

Keywords: MSW landfill, groundwater geochemistry, contamination

**THE INFLUENCE DETERMINED BY THE CHANGING OF MARK
CLIMATIC PARAMETERS UPON THE HYDROLOGICAL REGIME
IN SOUTHERN ROMANIA**

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ABSTRACT

The paper provides an analysis of the evolution and of the spatial – temporal variation of two main climatic parameters (precipitation and evaporation-transpiration) and one hydrological parameter (the flowing water volume) during a common period of time (the 1961-2012 interval) in southern part of Romania, more specifically over the Romanian Plain. We have started our analysis from the water balance equation applicable to a large geographic area and valid for long periods of time.

The hydro-geological reports show that the sub-surface water resource is quasi-constant, being hold in a relative equilibrium. Thus, for large areas and over long periods of time the water exchange with nearby territories may be neglected.

The water balance equation contains two climatic parameters (precipitation and evaporation-transpiration) that will be referred to as mark climatic parameters because they represent the main factors that determine the volume of the water run-off in a hydrological system. Any change upon them will therefore have an impact upon the surface liquid flow. The analysis of the evolution of the above-mentioned parameters was achieved based on the data provided by 6 hydrological and evaporimetric stations located in the Romanian Plain, resulting in an interpretation of the impact that the changes of the climatic parameters mentioned above may cause in the hydrological system, represented by the volume of the liquid surface water.

Such a parallel study regarding the three parameters described above may offer important information regarding the interaction between the climatic and the hydrologic systems in a regional context.

Keywords: mark climatic parameters, water balance, evaporation, tendency

THE INFLUENCE OF ORE MINING WATER TREATMENT ON DRINKING WATER PARAMETERS

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ABSTRACT

In treating mine water from ore extraction, a sample from Zlaté Hory was used, where ores, such as Cu, Pb, Zn, Ag and Au, used to be mined. Such mine water is characteristic of lower pH values and higher concentrations of Mn, Fe, Zn, Cu and SO_4^{2-} . The objective of the mine water treatment experiments was to comply with the physical - chemical and microbiological quality requirements for drinking water. According to the drinking water quality requirements, in the mine water there were increased concentrations of Mn 2.8mg.l^{-1} ; Fe 1.1mg.l^{-1} ; Zn 6.2mg.l^{-1} ; Cu 2.6mg.l^{-1} ; SO_4^{2-} 480mg.l^{-1} ; N- NH_4 1.6mg.l^{-1} and the pH value of the mine water sample was 4.7. Organic, biological and microbiological pollution of the mine water sample was minimal. In mine water treatment the processes of alkalization, filtration, ion exchange and microbial stabilisation were applied. Calcium hydroxide, in the form of limewash, was used for alkalization, which was followed by filtration of the settled sample. Ion exchange was applied only on 2/3 of the sample water, which was later mixed with the rest of the pre-treated water. Next, the water was stabilised using ClO_2 produced via Twinoxide technology. The analyses results of such treated water, both microbiological as well as physical-chemical, meet the requirements set for drinking water quality. **Keywords:** ore mining water, treatment, ion exchange, drinking water, Twinoxide technology

THE SHEET EROSION ANALYSIS AND THE SEDIMENT TRANSPORT CALCULATION METHOD AT THE EXPERIMENTAL AREA

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ABSTRACT

This article deals with describing of sheet erosion at the experimental area of The Pozarsky stream catchment. The experimental area is located near the town Krivoklát, in the Central Bohemian Region, where highlands dominate. This area is characterized by the occurrence of very deep valley, shaped like the letter "U" to "V", which contain torrents and often deep gullies. In this experimental area, there are built five torrent control cross-section objects. Especially two of them are located in the gullies, which are surrounded by managed fields. There is an assumption of the sheet erosion occurrence.

In this topic, there are two „points of view“ presented – solving of water erosion at fields which is presented mainly like soil loss and on the other hand there is solving of sediment transport at steep land area at a torrent (gully) catchment.

To understand the principles of release, transport and storage of sediment in the channel of torrent (in the bed of gully) it is needed to calculate sediment transport regime. For the calculation it is necessary to carry out detailed field surveys and surveys about erosion in the area. The calculation give an overview of the formation of sediment in the catchment, especially with their assumed amount and volume.

This knowledge contains basic data for the design of appropriate torrent control objects, such as constructions of some cross-section objects, and then determines the type and parameters of necessary precautions and in this case it gives the possibility to verify torrent (gully) control objects functions.

Attention is focused on defining the source areas of released sediment particles in the catchment and their movement in the bed of the stream (gully) from their place of release to their place of storage (in the streambed area or retention capacity of the experimental objects).

Keywords: Water erosion, sediment transport, torrent and gully control

**THE STIMULATING EFFECT OF BIOMETALLS ON CREATION,
TRANSFORMATION AND ACCUMULATION OF PRIMARY
TRANSFORMATION PRODUCTION OF EPICONTINENTAL SEAS**

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ABSTRACT

In this study, the author attempted to identify sources of income and accumulation of vanadium and nickel in oils. The author, not focusing on any of the two theories of "organic" and "inorganic" origin of oil, tried to objectively examine the involvement of vanadium and nickel in the life cycle of primary production and decomposition of organic matter epicontinental basins. The study also considered the findings of scientists from various related specialties: geochemists, oceanographers algologist, biochemists. It turned out that the vanadium and nickel forms stable complexes with various metal contents inherent in each of the individual fields. One of the distinctive properties of vanadium - polyvalency - the ability to change the valence of two or three valence juvenile to the pentavalent (form finding vanadium in oils). Valence of vanadium is in direct proportion to the degree of his participation in the life cycle and postmortem diogeneticheskikh transformation of primary production. This article describes the impact of fluctuations in the content biometalov (vanadium and nickel) in water, as one of the most important factors of education of primary production epicontinental basins, where they get to the drain of the rivers. Experimental way transpired sources of vanadium in the river associated with tectonic faults. To set the geographic pattern of nickel contents decrease in the estuaries of the rivers from west to east (within the Russian Federation). The exact sources of nickel in the water of the rivers have not been established. This research confirms the importance of biometals (vanadium and nickel), not only in terms of their presence in the oil as a complex, but also directly participate in the carbon cycle.

Keywords: oil, vanadium, nickel, primary production, destruction of organic matter, tectonic faults

**THE USE OF THE MUSKINGUM-CUNGE METHOD FOR THE SIMULATION
OF ARTIFICIAL FLOW WAVES FROM PEAKING HYDROPOWER
OPERATION (A CASE STUDY ON THE DANUBE, DOWNSTREAM THE
GABČÍKOVO HYDROPOWER)**

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ABSTRACT

The Muskingum-Cunge method is one of the most hydrological routing models which describe the transformation of the flow wave in the river bed based on two equations (storage and continuity equation). Despite the fact that the Muskingum-Cunge method is not suitable for rapidly rising and falling hydrographs, the paper describes the application of this method for the simulation of artificial flow waves from peaking (semi-peaking) operation of the Gabčíkovo Hydropower (HP). The flow wave routing model by the Muskingum-Cunge is integrated into the software tool for planning and control of the Gabčíkovo HP. The purpose of the flow routing model is ensured safety of navigation downstream the Gabčíkovo HP. The modeling results showed the possibility of using the Muskingum-Cunge method for the simulation of the “artificial” flow waves.

Keywords: Muskingum-Cunge method, artificial flow simulation, hydropower, safety of navigation

URBAN WATER WITHDRAWAL AND SUPPLY IN ITALIAN RIVER BASIN DISTRICTS

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ABSTRACT

The present paper offers an analysis of the volumes of water implicated in the three sub-systems of the Italian water supply system for the private sector: withdrawals, adduction, and distribution.

The purpose is to propose a methodology for assessing the physical availability of water resources

in Italy and the effects produced by the consumption levels for those resources within various hydrogeohydrogeological and management contexts. The information analysed in this document was drawn from the “Urban Water Census”, a survey that is periodically conducted by the Italian National Institute of Statistics (Istat) in order to analyse the water supply framework for private use in Italy. This survey is the only official and systematic source of data for the sector. The reference year of the data analysed is 2008, the most recent year for which census data is available. The frequency of these kind of census is not constant, but in the last twenty years it has been of about five years. So the methodology analysis, proposed in this paper will be applied to the next census data, which will be collected on next year.

Keywords: water resources, water supply, water management, river basin districts, Italy

USE OF GREEN ROOFS AS A WATER RESOURCE

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ABSTRACT

Green roofs have many advantages: improving the roof thermal insulation, noise absorption, temperature and humidity control in cities (urban microclimate), fire resistance and protection of roof structural surface layers against UV- radiation. The most important green roof ability, which appears as a key feature in terms of rainwater management in urban catchments is the ability of rainwater detention and retention. To increase the retention capacity of green roofs are being used in addition to the drainage layer and the storage layer, which in hydrological terms significantly change the properties of these roofs.

Apart from this - there is a need to develop and use green roof growing substrates that minimize leaching of nutrients and other contaminants while still providing adequate physical and chemical properties for plant growth. Organic matter included in the substrate is very beneficial for plant growth, but when it decomposes it may leach nutrients. Components such as recycled waste materials and by-products have a potential, but concentrations of contaminants must be considered.

This paper describes preliminary results of a scientific project VEGA 1/0691/13, focused on experimental research of the hydrological function of green roofs in urban areas with regard to the reduction and the detention of rainfall runoff, which may be one of the crucial factors for sustainable urban development. Another objective of the research is to test the filtration ability of green roofs, rainwater runoff quality and possible use of green roofs as a supplementary source of service water in urban areas.

At the same time waste materials are tested, which could be used for the substrate layer for green roof plants. As a suitable material a mixture of dry sludge from municipal waste water treatment plant and peat substrate is tested. Other experiments are focused to the option to add simple filtering device directly into the roof structure, or their placement in the outflow area. Therefore another objective of the project is to explore the use of possible filtration materials (e.g. natural zeolite). This material has excellent absorption ability and together with an activated carbon filter it could create an effective system for green roofs runoff pollution reduction. We assume that water collected this way can be in some cases a valuable source of service water and can be used in many private or commercial applications.

Keywords: green roofs, water resource, water quality, runoff reduction, runoff regulation

USING MULTIVARIATE STATISTICAL METHODS TO ASSESS DRINKING WATER QUALITY FROM URBAN WATER SUPPLY IN IASI CITY, ROMANIA

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ABSTRACT

The quality of drinking-water is a powerful environmental determinant of health. The World Health Organization, in Water Quality and Health Strategy 2013-2020, highlights that the quality of water has an important impact on health, whether used for drinking, domestic purposes, food production or recreational purposes. Romania obtained, under the terms of the Accession Treaty, transition periods to comply compliance with the regulations regarding drinking water quality standards until 2015. Regarding the quality of drinking water, the main task under the Drinking Water Directive is to meet the quality standards of drinking water provided by centralized systems.

Drinking water supply of Iasi is made from ground and surface sources, stored in 25 tanks (9 underground and 15 for the surface sources). The quality of drinking water supplied in each storage tank is daily monitored, aiming on mainly physico-chemical indicators (temperature, water hardness, pH, oxidability, ammonium, nitrites) and microbiological ones. The research methodology follow three main stages: collecting daily data sets about water quality, ascending hierarchy of water quality from storage tanks, and selecting the most important indicators for assessing drinking water quality. For the evaluation of spatial variation of water quality data of Iasi between 2007 and 2014, multivariate statistical methods were used in finding hidden relationships among them as well as data clustering. After the determination of the parameter correlation matrix, eigenvalues and factor loadings have been determined. All statistical computation was made using SPSS software. PCA (Principal Component Analysis) is a data analysis technique used to describe the multivariate structure of the data, being helpful in identifying meaningful underlying variables and to reduce the dimensionality of a set of data and determine linear relationships between the variables.

The aim of this paper is to use PCA for reducing the number of indicators, which must be determined during a regular monitoring, and to recognize basic features of drinking water quality. The fairness of the PCA results was verified by the cluster and factor analysis.

Keywords: drinking water quality, Iasi city, multivariate statistical methods

**UTILIZATING DRY POLDER AS FLOOD MEASURES
IN AGRICULTURAL LANDSCAPE**

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ABSTRACT

Dry polders were observed in the Silesian village Bolatice. Integrated fully functional system of flood protection is implemented around the village. Runoffs from the watersheds of tanks were calculated with design precipitation in scope of retention of water in the agricultural landscape. Average annual values of loss of soil were calculated on the selected slopes of polders for evaluating the intensity of water erosion. Model areas, for example meadows or fields with diverse crop cultivation, were used in this work. At the end the functions of dry polders are evaluated.

Keywords: water retention in the agricultural landscape, dry polder, rain water runoff, water erosion, soil erosion

VALUES OF DISPERSION COEFFICIENTS IN STREAMS WITH DIFFERENT FLOW CHARACTER – A CASE STUDY

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ABSTRACT

Water quality modelling is currently very effective and important tool in context of the task to ensure the required quality of water resources, respectively, to achieve (maintain) good water status according the Water Framework Directive (2000/60/EC). Mathematical models of water quality are an important tool for integrated water management, planning and protection. Integral part of such models is the modelling of fundamental physical processes affecting water quality - advection and dispersion.

This paper documents results of measurements of the dispersion coefficient within the scientific project APVV 0274-10. Measurements in this project have been performed in various surface water bodies in Slovakia - lowland streams with low turbulence (drainage, irrigation channels), as well as in mountain streams with a high degree of turbulence. Within the field experiments both longitudinal, so as the transverse dispersion coefficients were measured.

Keywords: dispersion coefficient, case study, flow turbulence

WATER FLOW AND SILTATION OF THE SUPPLY CHANNELS IN RAZELM-SINOIE ECOSYSTEM, AS PART OF THE DANUBE DELTA

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ABSTRACT

Continuous hydrological measurements carried out by the authors in the period 2009 - 2013 on some channels from the Danube Delta, such as Fundata, Fundea, Mustaca, Dunavat and Dranov, show that annual average turbidity of suspension alluvia of Danube discharge is 214 g/m³ as compared to 206 g/m³ in 2009, as the reference level for the 1989-2013 period. From statistical analysis of secular variation of the water turbidity in the Danube Delta it was found out a sensitive decreasing tendency, caused mainly due to the hydrotechnical works, like check dams that were build up in the Danube Delta catchment, but also due to the hydrological drought from recent period of time, excepting year 2010 when the historical flow of Danube River was 17,900 m³/s at the Delta entrance.

In the meantime, measurements done by the authors together with specialists from two research institutions, AQUA PROJECT and ICIM Bucharest, for the same period of time, have revealed that some of the supply channels of Razelm - Sinoie system are fill up to about 30-40% (flow section) in comparison with 20% in 2009 and the adjacent channels of the Danube Delta between the Saint Gheorghe channel, the Black Sea and the water system are completely fill up, as they were in year 2009. Based on the same measurements the authors checked out the already known correlations between fluid and solid flows in the main supplying channels of Razelm-Sinoie River System.

In this respect, for the analyzed period of 2009-2013, the paper highlights the essence of the physical phenomenon of alluvia transport for developing computational models that accurately reproduce this phenomenon, and also shows that between fluid and solid flow there are distinctly significant correlations for the Fundea, Fundata and Dranov channels, and significant correlations for the Dunavat and Mustaca channels.

Keywords: siltation, fluid flow, solid flow, turbidity, drive critical effort.

WATER QUALITY CONTROL IN PUBLIC SUPPLY SPRINGS AND WELLS OF VITERBO AREA, CENTRAL ITALY

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ABSTRACT

Most people in Viterbo area, Central Italy, meet their domestic needs from groundwater resources. This paper assesses the geochemical characteristics of most part of public water supply network in Viterbo area and their suitability for drinking and agricultural purposes. More than two hundred water samples were collected from springs and wells for the evaluation of water quality parameters and the results were compared to the World Health Organization (WHO) standards. Principal component analysis (PCA) was applied to water hydrochemical data in the aim of understanding main processes controlling water chemistry. The first two PCs (PC1 and PC2) explain 73.1 % of the total variance within all the measured parameters. Based on the loading plot between the first two components three different groups were identified (Group A: EC, Na, Ca, NO₃, Cl and SO₄ and T; Group B: Mg, TDS, K, F and HCO₃ and Group C: pH) reflecting the main rock types in the area investigated, where the volcanic materials are the most dominant formations. Water samples are characterized by three hydrochemical types: (A) Na-HCO₃, (B) Na-Ca HCO₃ and (C) Ca -HCO₃. The results show that most of the waters within the study area are slightly acidic to slightly alkaline nature with TDS values below 500 mg/l, however some samples from Facies C show higher TDS values (up to 1480 mg/l) and classified as brackish water. The total hardness of water samples from Facies A and B range from 32.3 to 186.3 mg/l and fall between soft and hard water category, while the samples from Facies C classified as soft to very hard water with the highest value of 716.5 mg/l. US Salinity diagram (USDA) was used to evaluate the water quality for irrigation and most water samples distributed in category C1-S1, C2-S1 and C3-S1 highlighting low to high salinity hazard and low sodium content class. According to calculated values of percentage sodium (Na %), magnesium hazard (MH), Kellys ratio (KR) and permeability index (PI), the springs and groundwater are suitable for irrigation. The chemical constituents, such as Ca, Mg, Na, K, Cl, HCO₃, SO₄ etc., in most of the water samples are within the permissible limits of the World Health Organization (WHO) drinking water quality guidelines. However, the presence of high fluoride (max: 3.23 mg/l), nitrate (max: 100 mg/l), and arsenic (max: 57 µg/l) concentrations, exceeding the permitted limits in some springs and wells, threat human health in the area.

Keywords: water quality, public supply wells and springs, hydrochemistry, PCA, Viterbo area

**WATER QUALITY DEGRADATION IN THE RESERVOIR „GRLISTE“ AS A
RESULT OF INADEQUATE IMPLEMENTATION OF SANITARY
PROTECTION ZONE**

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ABSTRACT

Lakes and reservoirs, except groundwater and surface water, are in use for water supplying. In most cases, the reservoir was considered as a physical object from the hydroconstrucional and hydrogeological aspects and the ecological and biological aspects was ignored. Reservoirs are objects that were created by anthropogenic activities in the basin. They have their own singularity and their developmental stages. In the last-the evolution phase reservoir is affected by eutrophication, whose intensity depends on the amount of nutrients from the basin. Natural and anthropogenic influences give them more characteristic of unstable aquatic systems, dominated by the processes of eutrophication. With regard to development of eutrophication in reservoirs with water suppling as the main purpose, becomes actual again after frequent blooms, significant amounts of cyanotoxins and consumer complaints about sensory properties of drinking water. The aim of this study was to identify the causes that lead to the degradation of the water quality in the reservoir, and the factors that they have a long term effect on its trophicity. The establishment of sanitary protection zones are the key factors for the maintenance of water quality in reservoirs.

Keywords: water reservoir, water supply, eutrophication, degradation.

**WATER RESOURCES AND CLIMATE CHANGE AND DROUGHT IN THE
CONTEXT OF WATER AND ENVIRONMENTAL MANAGEMENT AND
POLICIES IN BULGARIA**

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ABSTRACT

Now a days climate change and extreme events and droughts in particular could be considered as a fact. As infinity but limited good, water resources are very sensitive to these aspects and require adoption of special measures. This is realized by passing an appropriate legislation and its practical implementation with the help of new technologies, methods and instruments appropriate with scientific knowledge and innovations in the field. Concerning Water as a main driver could be pointed Water Framework Directive and related documents. But IPCC and other conventions and directives turns view on these problems either. By the moment in Bulgaria this is realized in parallel term in the context of Climate change policy and in context of sector Waters. And Integrated Water Resources Management (IWRM) and River Basin Management (RBM) in particular and Environmental Management as tools for practical implementation of drought and Climate Change mitigation and adaptation must put special attention on both aspects.

In help of professionals and decision makers related to water this article aims briefly to present main aspects and common ground of pointed categories highlighting the possibility of integration between them to ensure environmentally responsible behavior, sustainable development and “green” future practices.

Keywords: drought, water resources management, river basin management, environmental management, climate change

**WATER RESOURCES, DURABLE MANAGEMENT
AND MAINTENANCE WORK**

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ABSTRACT

Water, the sources of life and abundance for the humanity (the need for water by adult is 2 in 2,5littres a day going to 15L), and with the disponibilte did not still receive the attention which it deserves in the practices, even if the discussions about the long-lasting use of natural resources are accentuate, especially in the context of the management of the political officers and the aggression of the environment (warm-up by factories). The resource management in water is a relatively new and complex domain of reflection for numerous countries.

Major efforts must be deployed to insure a management sustainable and responsible for water resources to respect the environment and insure the human and animal. the industrial revolution is more and more fast, susceptibility waters to the pollution, more the shortage in natural resources is stressed needs during the life. The fragility is at first according to a number of factual elements such us type of infrastructure, maintenance and the daily volume of consumption as well as the climate[3]. (Reservoirs, covers of water, irrigation channels distribution networks) However, she is also in office of diverse risks in which these hydraulic infrastructures are exposed to climate change, earthquakes, the constant increase of the need. In our intervention on natural resources and their management and quality of the works, we are going to put the point on a real case situated in the Daira of M'chedallah few kilometers away from LALA KHEDIDJA (TIKJDA) summit of DJURDJURA. A census of sources, Oueds theirs profitability and management.

Keywords: water, management, source, Djurdjura, source Ainçar averkane