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Physiography and nature monitoring in the Kampinoski National Park and its buffer zone

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247-253

Abstract
Kampinoski National Park with its buffer zone (Biosphere Reserve Puszcza Kampinoska) encompasses 90% of the catchment of the river Łasica. It's area is well separated from surrounding as a part of Vistula river pre-valley with diversified structure of dunes and marshes. It is a high value, natural site neighboring to the big city – Warsaw. Wide range research of natural resources (including broad hydrological and hydrogeological survey) have been conducted since beginning of 20th century. Detailed monitoring of water condition is provided since 1998 enabling calculating of water balance of the area. Integrated monitoring in scale of small catchment is provided as a part of state monitoring system.
Key words: Kampinoski National Park, Biosphere Reserve Puszcza Kampinoska, climate, geology, hydrology, nature monitoring,

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Basis for analysis of water circulation in the underground water system of the Kampinoski National Park

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255-256

Abstract
Recognition of the underground water system dynamics in relation with the surface and atmospheric water system decides about forecasting possibilities for the transformation character and directions of the Kampinos Forest ecosystem. The program of hydrogeological research was executed at IHiGI Underground Water Hydrology Institute Department of Geology University of Warsaw within the international research program, Marie Curie-Składowska grant. It was realised to gather data for establishing the basis for a justified model of water and substances circulation, integrated with other systems.
Key words: underground water system, water circulation, substances circulation

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Hydrogeological conditions of the Kampinoski National Park (KNP) region

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257-266

Abstract
Kampinoski National Park (KNP) and its protection zone are located within the valley type hydrogeological unit in a terrace area. There is one aquifer horizon with thickness ranging from 10 to 50 meters, and the considerable potential for water conductance is mainly supplied by precipitation and drained by the watercourses. Analysis of hydrogeological conditions indicates there are hydrodynamic differences of individual regions within the KNP and its protection zone. The distinguished hydrodynamic zones are characterised by similar groundwater dynamics, supply means or drainage of the aquifer, geological and geomorphological structure, subsurface sediment lithology, vegetation, depth of groundwater table, water level amplitude changes and human economic activities. Recognition of the Kampinoski National Park hydrogeological conditions is quite good. But the present recognition status of this area indicates a need for further research of continued monitoring observations of ground and surface water levels, groundwater quality, hydrodynamic role of hydrogeological unit „borders" in which the Park and its protection zone.
Keywords: Kampinoski National Park, Kampinos terrace, data, hydrogeological conditions, hydrodynamic zones, anthropogenic transformations

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Results of geophysical research in the Kampinoski National Park area.

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267-272

Abstract
As a result of geophysical research the deposition depth of the Pliocene clay roof which occur in the base of the aquifer in Kampinoski National Park (KNP) region was recognised and thickness and lithology of the aquifer was determined. The research results significantly increased the number of details in the previous geophysical research and indicate for local presence of tri-partite character of the aquifer in the vertical profile. The construction of hydrogeologic mathematical model of the central part of Kampinoski National Park (Krogulec, Rossa 2003) was preceded by a detailed analysis of the electroresistance research in the cross section.
Keywords: Kampinoski National Park, Kampinos terrace, Błonie Level, geoelectric research, electroresistance research

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Dynamics of groundwater table changes in the area of the Kampinoski National Park and its protection zone

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273-277

Abstract
The water monitoring network in the area of the Kampinoski National Park (KNP) and its protection zone was designed in 1995. It is an example of local network designed especially for tracking the states and dynamics of changes taking place in the water system within the National Park and its extensive protection zone (surroundings). Interpretation of the piezometer and water level gauges measurement results enabled researches to give a diagnosis of the environmental status in the scope of meeting water demand of the KNP biotic part. It also enables managers to forecast the direction, rate and course of changes in water relations caused by external and internal factors. The evaluation of groundwater dynamics changes enables a broadened hydrodynamic characterisation of the determined zones.
Keywords: groundwater monitoring network, groundwater table changes, hydrodynamic zones

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Hydrogeological model research scope and results for the Kampinoski National Park and its protection zone

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279-284

Abstract
Hydrogeological conditions of the Kampinoski National Park (KNP) region are subject of scientific research for years. The applied methods differ depending on the chosen target, and include field observations, analysis of the rich archival material, geophysical measurements, construction of analogue (1970s and beginning of the 1980s) and digital models.
KNP, due to its location within the valley type hydrogeological unit with a relatively unequivocal hydrogeological scheme, became an object of model research at the end of the 1970s. A flat model hydrogeologic mathematical model in a cross section was made in the central part of the KNP in 2001 within the realisation of an international grant - Maria Curie-Składowska fund (Krogulec, Rossa 2003 this issue). It allowed for an analysis of hydrogeological conditions in the investigated area and prepared a methodical basis to evaluate the circulation diagram in the whole hydrogeological unit. This model was made based on a detailed survey of the hydrogeological conditions and research results in the KPN area.
Key words: Kampinoski National Park, digital models

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Hydrogeological mathematical model of the Kampinoski National Park central part

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285-290

Abstract
A hydrogeological model research was executed on a cross section located in the central part of the Kampinoski National Park (KNP) within the research program financed from the Maria Curie-Skłodowska fund and statutory research of the Warsaw University.
The research goal was to determine the structure of the filtration stream in the region, thus the distribution and value of hydrogeologic parameters and filtration field.
The presented model includes a fragment of the Vistula River valley reconstructing the filtration field in Quaternary valley sediments. The construction of the model was preceded by a detailed analysis of the geological structure and hydrogeologic conditions. A broad and detailed field research was performed, amongst others including electroresistance research in the cross section (Krogulec, Pomianowski 2001), measurements of underground and surface water levels and analysis of data from archive boreholes.
Keywords: Kampinoski National Park, digital model, water balance, hydrogeologic parameters

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Water balance as base for proper water management in the Łasica catchment (Kampinoski National Park)

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291-309

Abstract

History of the water balance circulation has been presented, leading to a modern form of the equation considering all components. This equation has been applied for the Łasica catchment located in the protected area of Kampinoski National Park.

Variability of water balance components has been estimated using long term monthly values taken during the period between 1951-2000, obtained from Institute of Meteorology and Water Management (IMWM). In the water balance equation 8 independent elements have been considered: corrected atmospheric precipitation, river runoff (surface and base), potential and land evaporation, change of water retention in the saturation and aeration zone. The last element has been analysed in a long term perspective with an attempt to predict their behaviour in the future.

Key words: water balance, long term variability, precipitation, evaporation, runoff (surface and groundwater), retention.

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Risk assessment of the occurrence of extreme groundwater levels, discharge and soil moisture stages

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311-321

Abstract
Extreme groundwater levels, discharge values and soil moisture stages are considered here as hazardous situations. Trends detected in the long-term precipitation course are followed by the groundwater levels and discharge courses. A delay of groundwater levels and discharge courses as compared to the precipitation course was observed which is due to the basin's inertia. Risk of the occurrence of characteristic groundwater levels and discharge values is evaluated as an exceedance probability and as a less than or equal to probability. Spatial distribution of the variability of soil water storage has been derived. Results indicate that the basin sensitivity to water deficits is greater than the basin's reaction to the excess water.
Key words: hydrologic extremes, long-term variation, wet and dry periods

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Mathematical modelling of water and solute vertical transport (on the example of chloride ion) in the plant-soil column in the Pożary basin.

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323-339

Abstract
Vertical component predominates in water balance of lowland swampy catchment. A one-dimensional mathematical model has been developed here which couples the description of the following processes taking part in the vertical migration of water: land evaporation, interception of plant canopy, and infiltration represented by soil moisture changes. These processes are handled as a background for the migration of solutes to the groundwater table. Every part of the model describing the individual process is physically based and related to another one by input-output parameters. Identification of parameters and verification of the model were performed in the Pożary basin in three selected representative plant-soil columns. Model was tested using chloride ion as exemplary. This paper presents the results of modelling over a short summer period. It was found that the greatest role in summer recharge is played by long lasting intensive precipitation episodes. Since the results were considered to be quite good, it is possible to use the model for the simulation of water and solute vertical transport in swampy catchments.
Key words: interception, land evaporation, infiltration, unsaturated zone, estimation of model parameters

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Geographic Information System (GIS) of the Kampinoski National Park and surrounding areas – for hydrogeological purposes.

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341-344

Abstract
The paper is devoted to the methodology of preparing a digital database of topographic and other scientific data for the area of the Kampinowski National Park and its vicinities, using the GIS (Geographic Information System) technology. The database has been created for the needs of hydrogeology, and particularly to aid the processes of data preparation for mathematical hydrogeological modelling.
Key words: hydrogeology, Kampinoski National Park, Geographic Information Systems (GIS).

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Electronic measurements of groundwater level in the Kampinoski National Park

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345-350

Abstract:
Electronic dataloggers, "Divers," to measure groundwater levels were installed in four piezometers selected from the groundwater monitoring network in Kampinoski National Park. It has been stated that in the temperate climate zone the use of Baro-Diver is necessary to obtain correct results due to the sudden changes of atmospheric pressure. The comparison of data gained manually and automatically showed that manual measurements correspond with automatic ones. "Divers" enable research on short-term dynamics of the groundwater table while manual measurements taken every two weeks are sufficient for long-term changes. Continuation of experiments on the improvement and reliability of measurement methods, suspension depth of dataloggers and methods of efficient calculations is necessary.
Key words: groundwater table dynamics, Diver dataloggers, groundwater monitoring network

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Long-term tendencies of water circulation in the protected lowland Łasica river basin

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351-358

Abstract
On the basis of analysis of trends of river flow, phreatic water levels and climate elements, the problem of intensifying water deficit in the Łasica river basin is described. Method of time trend analysis of water circulation elements tendencies was presented. Hydrological consequences in the basin are forecasted assuming two scenarios of global climate change: pessimistic GFDL and moderately optimistic GISS. The basin of the Łasica River (a tributary of the Bzura) is one of the lowland regions in Poland that is particularly threatened by water deficits in different seasons and years. This is the result of relatively low annual precipitation, as well as of human activity.
Water deficit can be confirmed hydrologically in long term negative annual trends of runoff, land evapotranspiration in the Łasica and the Utrata and for phreatic groundwater.
Assuming GFDL and GISS global climate change scenarios, an analysis of mesoscale regional air temperature and precipitation changes was made and their hydrological consequences were forecasted.
Negative trends were noted for vertical feeding of groundwater in the cases of both the pessimistic GFDL and the moderately pessimistic GISS scenarios.
Key words: human impact in water circulation, land reclamation, water circulation, trends of water elements.