

## Hydrology in Croatia, 1991–1994

*Report to the International Association of Hydrological Sciences of  
the International Union of Geodesy and Geophysics*

Between 1991 and 1994 hydrologic studies in Croatia have been performed mainly by the Institute of Hydrology and Meteorology, Zagreb.

Over the past four years Croatian hydrologists paid considerable attention to the following activities:

*a) Hydrological research in a changing environment*

– Improving knowledge of the processes involved in the hydrological cycle and determining the manner in which these processes might be most appropriately described to meet the demands for planning, design, construction, maintenance and operation of water management schemes within changing environmental situations including the possibility of climate change.

– Providing, in cooperation with the international scientific community, a general framework for the regional and national development of hydrology and the related water sciences.

*b) Management of water resources for sustainable development*

– Providing methodologies for the assessment and integrated management of water resources to meet the needs of society.

– Promoting and providing methodologies, and assist in the establishment and development of scientific and technical water-related information and documentation systems.

– Providing methodologies for the evaluation of the environmental status of freshwater systems, their protection and conservation, and for the evaluation and prediction of the impacts of management activities.

*c) Education, training, transfer of knowledge and public information*

– Promoting, implementing and providing methodological guidelines for education and training programmes in the fields of hydrology and other relevant water sciences for technicians and professionals.

– Elaborating guidelines towards the transfer of scientific and technological knowledge between researchers and practitioners.

– Developing procedures and guidelines for providing relevant water-related information to the general public, planners and decision-makers, and specialists in related fields.

Most of hydrology related data and information may be obtained through the National Information System of Hydrology and Meteorology (NISHM), managed by the Institute of Hydrology and Meteorology in Zagreb. The ma-

rine, terrestrial and atmospheric digital data since 1926 cover all of the continental and marine parts of Croatia. The data may be accessed in the batch or interactive modes. The hydrology related data bases include those dealing with agriculture, evapotranspiration, precipitation, surface water (surface hydrological features, streamflow distribution, streamflow seasonality and data on monitoring sites and on surface water use) and below land surface hydrological data (aquifer data, water flow models, ground water level and quality data, hydrological sections, and data on subsidence, water table elevation, ground-water extraction and well construction).

### *Selected papers*

- Biondić, B. and Dukarić, F. (1993): Water resources in the region of Rijeka. *Hrvatske vode*, No. 3, 185–190.
- Bonacci, O. (1991): The influence of errors in precipitation measurements on the accuracy of the evaporation measurements performed by a class A evaporation pan. *Theoretical and Applied Climatology*, **43**, 181–183.
- Bonacci, O. (1992): Hydrograms of karst springs as aquifer indicators. *Građevinar*, **44**, 379–386.
- Bonacci, O. (1993): The Vrana Lake hydrology (Island of Cres – Croatia), *Water Resources Bulletin*, **29**, 407–414.
- Bonacci, O. (1993): Hydrological identification of drought. *Hydrological Processes*, **7**, 249–262.
- Bonacci, O. (1993): Karst springs hydrographs as indicators of karst aquifers. *Hydrological Sciences Journal – Journal des sciences hydrologiques*, **38**, 51–62.
- Bonacci, O. (1995): Ground water behaviour in karst – example of the ombla spring (Croatia), *Journal of Hydrology*, **165**, 113–134.
- Bonacci O. and Bojanić D. (1991): Rhythmic karst springs. *Hydrological Sciences Journal – Journal des sciences hydrologiques*, **36**, 35–47.
- Bonacci, O., Tadić, Z. and Trninić, D. (1992): Effects of dams and reservoirs on the hydrological characteristics of the lower Drava river. *Regulated Rivers – Research & Management*, **7**, 349–357.
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- Bonacci, O. and Živaljević R. (1993): Hydrological explanation of the flow in karst - example of the Crnojevića spring. *Journal of Hydrology*, **146**, 405–419.
- Pandžić, K. and Trninić, D. (1991): Principal component analysis of the annual regime of hydrological and meteorological fields in a river basin. *International Journal of Climatology*, **11**, 909–922.
- Pandžić, K. and Trninić, D. (1992): Principal component analysis of a river basin discharge and precipitation anomaly fields associated with the global circulation. *Journal of Hydrology*, **132**, 343–360.
- Pršić, M. (1994): Statistical and spectral wave parameters for the Adriatic Sea. *Građevinar*, **46**, 269–280.

- Rubinić, J. and Ožanić, N. (1992): Hydrological characteristics of the Vransko Lake on the island of Cres. *Građevinar*, **44**, 499–530.
- Trninić, D. (1993): Low discharges in the Sava river at Zagreb in 1992. *Hrvatske vode*, No. 3, 195–199.
- Trninić, D. (1994): Hydrological analysis of high flows and floods in the Sava at Zagreb. *Hrvatske vode*, No. 7, 479–484.
- Trninić, D. and Slamar, T. (1993): Evaluation of hydrological drought and a survey of high waters in the area of Croatia in the year 1992. *Journal of the Institute of Hydrology and Meteorology*, **16**, 107–112.
- Trninić, D. and Slamar, T. (1994): Evaluation of the extreme hydrological drought and analysis of the high waters and floods in the Sava basin in 1993. *Journal of the Institute of Hydrology and Meteorology*, **17**, 153–159.
- Vrhovšek, D., Kosi, G. and Smolar, N. (1994): Limnological research of the Sotla river with regard to the dam at Podčetrtek. *Hrvatske vode*, No. 5, 293–302.
- Vukelić, Z. (1992): Contaminant-hydrologic conditions of microorganisms transport with filtrate from landfill in the subsurface. *Journal Research on Hydraulic Engineering*, 225–234.
- Žugaj, R. (1993): Relevant lengths of flow series. *Građevinar*, **45**, 319–330.
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- Žugaj, R. (1994): Average discharges in Croatian karst, *Hrvatske vode*, No. 8, 521–534.

*Master theses*

- Bojanić, D. (1994): Identification of hydrologic-hydraulic elements of runoff in karst. Faculty of Civil Engineering, Zagreb.
- Jurić, V. (1994): Contribution to the mathematical analysis of water stream trough porous unsaturated zones. Faculty of Civil Engineering, Zagreb.
- Ožanić, N. (1994): Hydrology of the Vransko Lake on the island of Cres, Faculty of Civil Engineering, Zagreb.

*Doctoral dissertations*

- Kuspilić, N. (1994): New type of stream function in the application of valve theory. Faculty of Civil Engineering, Zagreb.
- Trninić, D. (1994): Method for calculation of low waters in streams. Faculty of Civil Engineering, Zagreb.
- Žugaj, R. (1994): Regional analysis of hydrologic parameters in karst. Faculty of Civil Engineering, Zagreb.

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