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HIDROLOŠKI LETOPIS SLOVENIJE 2002

THE 2002 HYDROLOGICAL YEARBOOK OF SLOVENIA

AGENCIJA REPUBLIKE SLOVENIJE ZA OKOLJE

NASLOVNICA - COVER PAGE

Vodomerna postaja Divje jezero 9. aprila 2002 (foto: Niko Trišić).
The Divje jezero gauging station on the 9th April 2002 (photo: Niko Tršić).

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PREDGOVOR

Leto 2002 je bilo v svetovnem merilu nadpovprečno toplo, toplejše od leta pred njim. Po analizah Svetovne meteorološke organizacije (WMO) je bilo 2002 drugo najtoplejše leto v času zapisov, takoj za letom 1998. Globalne padavine so bile pod povprečjem primerjalnega obdobja.

Tudi v Sloveniji je bilo leto 2002 toplejše od primerjalnega obdobja, povečano je bilo izhlapevanje. Skupna letna količina padavin je bila v Sloveniji manjša od povprečja, največje odstopanje je bilo v skrajnem delu severovzhodne Slovenije. V primerjavi z dolgoletnimi obdobnimi povprečji je bilo padavin manj za 12 odstotkov, izhlapevanja je bilo več za 6 odstotkov, lastni površinski odtok iz Slovenije pa je bil manjši za 25 odstotkov. Posamezni elementi vodne bilance so v Hidrološkem letopisu Slovenije 2002 tokrat prvič posebej opisani.

Na slovenskih rekah so se leta 2002 nadaljevale nizkovodne razmere. Zaradi neugodnih padavinskih razmer so pretoki slovenskih rek predvsem v prvi polovici leta dosegali tudi od 10- do 20-letne povratne dobe malih pretokov. Tudi povprečne letne gladine podzemne vode so bile povečini pod povprečjem dolgoletnega primerjalnega obdobja, v vodonosnikih severovzhodne Slovenije pa zaradi izrazite hidrološke suše celo pod nizkim dolgoletnim povprečjem. Vodne zaloge se v aluvialnih vodonosnikih tega dela Slovenije niso obnovile na povprečno raven.

Kljub manjšemu skupnemu odtoku pa so večje reke in nekateri hudourniki v letu 2002 kar 33-krat prestopili bregove, povečini na območjih vsakoletnih poplav. Poplavna voda je v tem letu povzročila manjšo gmotno škodo na stanovanjskih in gospodarskih objektih, prometnicah in kmetijskih površinah.

Povsem drugačne pa so bile posledice katastrofalne povodnji v osrednji Evropi. Leto 2002 je v osrednji Evropi zaznamovala povodenj, ki jo glede na trajanje, pogostost in velikost prizadetega območja analitiki globalnih hidroloških razmer uvrščajo med najhujše povodnji tega leta v svetu. Ob povodnji je padlo v tem delu Evrope od 25 do 40 odstotkov povprečne letne količine padavin. Na Češkem so vodostaji v povirnih delih rek Labe, Berounke in Vltave dosegli 500-letno povratno dobo. Poplavljali so evropski veletoki Donava, Laba in pritoki, poplavljena so bila večja mesta v Avstriji, na Češkem in v Nemčiji. Življenje je izgubilo preko 100 ljudi. V povodnji je bilo skupno poškodovanih 25.300 hiš, prizadeto pa je bilo preko 250.000 km^2 ozemlja.

FOREWORD

On a global scale, the year 2002 was warmer than average and also warmer than the previous year. According to analyses done by the World Meteorological Organization (WMO), the year 2002 was the second hottest year in recorded history, ranking immediately after 1998. Global rainfall was below average level for the comparative period.

In Slovenia, the year 2002 was also warmer than the period it was compared with and the evaporation was also greater. The total annual rainfall in Slovenia was lower than average, the largest deviation being recorded in the outermost part of north-eastern Slovenia. Compared to means over a multi-annual period, rainfall was 12 percent lower with evaporation greater by 6 percent, while the surface discharges from Slovenia was nearly 25 percent lower. In the 2002 Hydrological Yearbook of Slovenia, individual elements of water balance are described for the first time.

In 2002 conditions of low water level continued on the Slovenian rivers. Due to unfavourable rainfall, the discharges of the Slovenian rivers, especially in the first half of the year, reached a level of the 10 to 20 year return period for low discharges. Additionally, the annual levels of ground waters generally stayed below the average of the multi-annual comparative period, while in the aquifers of north-eastern Slovenia they were, due to the prolonged hydrological drought, even lower than the low multi-annual mean. The water reserves in the alluvial aquifers of this part of Slovenia failed to renew to their average level.

Despite the lower total outflow, various large rivers and several smaller torrents overflowed 33 times during the year 2002, mostly in annual flooding areas. In that year floodwaters caused minor material damage to residential and economic structures, traffic ways and farmlands.

The results of the catastrophic floods in Central Europe were completely different. In Central Europe 2002 was marked by a flood that was classified, according to global hydrological conditions, as among the worst floods in the world for that year through its duration, frequency and the size of the stricken area. During this period, between 25 and 40 percent of the average annual rainfall for that part of Europe was recorded. The water levels of the rivers Elbe, Berounka and Vltava reached the 500-year return period. The large European rivers, the Danube, the Elbe and its tributaries overflowed and large cities in Austria, the Czech Republic and Germany were flooded. Over 100 people lost their lives. The

Evropska komisija je kmalu po katastrofalnih povodnjih v osrednji Evropi leta 2002 pričela s pripravo evropske strategije o trajnostnem varstvu pred poplavami. Izhajala je iz ugotovitev, da se poplavno tveganje v Evropi značilno povečuje. Poplave so v Evropi vse močnejše in vse pogostejše, vse bolj pa se povečuje tudi število ljudi in vrednost premoženja na poplavnih območjih. Prepoznavno je sporočilo zadnjih poplav: "Naučiti se moramo živeti s takimi dogodki. Storiti moramo vse, da se izognemo še hujšemu poplavljanju zaradi človekovih posegov, in se obnašati tako, da zmanjšamo ogroženost ljudi in premoženja. Prebivalstvo se mora zavedati možnih in dejanskih nevarnosti ter sprejemati preventivne ukrepe." Ob tem naj bi nova evropska direktiva o zmanjševanju poplavne ogroženosti zagotovila usklajevanje ukrepov na celotnih povodjih oz. obalnih območjih z namenom zmanjševanja poplavnega tveganja za ljudi, premoženje in okolje.

mag. Jože Uhan,
vodja sektorja za hidrologijo

flood also damaged 25,300 houses, while an area of 250,000 km^2 was affected.

Soon after the catastrophic 2002 floods in Central Europe, the European Commission began preparing a European strategy for permanent protection against flooding. Its origin stemmed from the conclusion that the flood risk in Europe had been increasing markedly. Floods in Europe are becoming both more frequent and more intensive, while the population and the value of property in the flood areas are also increasing. The message of the recent floods is distinct: "We have to learn to live with such events. We must do everything to avoid even more severe flooding caused by human activity, as well as behaving in such a manner so as to decrease the threat to people and property. The population must be aware of the possible and the actual danger and accept measures for its prevention." In addition, the new European directive on decreasing the threat of floods should ensure the coordination of measures in entire catchments and along riverbank areas with the purpose of decreasing the flood risk to people, property and the environment.

Jože Uhan, MSc
Head of the Hydrology Section

SPREMEMBE V MREŽI MERILNIH MEST HIDROLOŠKEGA MONITORINGA

Marjan Bat

V Hidrološkem letopisu Slovenije za leto 2002 objavljamo podatke 155 vodomernih postaj za meritve površinskih vodotokov in jezer. Med postaje, katerih podatki o vodostajih so bili iz različnih vzrokov nezanesljivi, ali pa smo opazovanja začasno prekinili, sta se v tem letu uvrstili vodomerni postaji Cankova na Kučnici (šifra 1100) in Rožni Vrh na Temenici (šifra 7310). Obe sta imeli samo vodomerno letev, kar pomeni, da je zbiranje podatkov odvisno le od vestnosti prostovoljnih opazovalcev. Od merilnih mest, katerih podatke objavljamo v hidrološkem letopisu, jih ima samo vodomer slaba petina (34). Kljub temu imajo nekatere od teh vodomernih postaj neprekinjene podatkovne nize, ki segajo v 50-ta leta. Med njimi je še vedno tudi vodomerna postaja Sveti Duh na Bohinjskem jezeru. Tudi ob tej priložnosti izrekamo našim opazovalcem priznanje in zahvalo. Prizadevamo si, da bi jih s postavitvijo podatkovnih zapisovalnikov čim bolj razbremenili. V letu 2002 je na vodomerni postaji Kal-Koritnica na Koritnici podatkovni zapisovalnik večji del leta že uspešno deloval. Na preostalih 121 vodomernih postajah so spreminjanje vodostajev beležili limnigrafi. Zaradi kontrole njihovega delovanja pa so opazovalci pomembni tudi tam. Hkrati predstavljajo živo vez z oddelkom za hidrološko prognozo.

Glede na Hidrološki letopis Slovenije za leto 2001 so v tej številki na novo objavljeni podatki za vodomerne postaje Iška vas na Iški (šifra 5425), Log pod Mangartom na Koritnici (šifra 8230) in Robič na Nadiži (šifra 8730), manjkajo pa podatki za že omenjeni Cankovo in Rožni Vrh ter ukinjeni vodomerni postaji Sodna vas I na Mestinjščici (šifra 4760) in Iška na Iški (šifra 5420). Ukinitev obeh je bila načrtovana zaradi izbire ustreznejših merskih presekov.

Za 149 vodomernih postaj so bili iz vodostajev in pretočnih krivulj določeni pretoki. Spet so objavljeni tudi za vodomerno postajo Celje II – brv (šifra 6140) na Savinji. Pet let jih zaradi motenj, ki jih je povzročalo delovanja jezov nekaj sto metrov gorvodno in dolvodno od merskega preseka, nismo določali.

V letu 2002 je bilo narejenih 983 hidrometričnih meritev. Ob hidrometrični meritvi je bil največji pretok izmerjen na Savi v Čatežu 25. oktobra (957 m^3/s ob srednji hitrosti 2.45 m/s). Po pretočni

CHANGES IN THE NETWORK OF HYDROLOGICAL GAUGING STATIONS

Marjan Bat

The 2002 Hydrological Yearbook of Slovenia presents data from 155 water gauging stations measuring surface watercourses and lakes. In that year, two water gauging stations were listed that produced unreliable data on water levels for various reasons or where observation had been temporarily suspended. These were the water gauging station Cankova on the Kučnica River (code 1100) and the station Rožni Vrh on the Temenica River (code 7310). Both had only a water gauge, meaning that data collection was dependant solely on the diligence of the voluntary observers. Among the measuring sites whose data are presented in the hydrological yearbook, less than a fifth of them have a water gauge (34). Despite that, some of these water gauging stations have uninterrupted data sets, reaching back to the 50s. The water gauging station Sveti Duh at Lake Bohinj is one of these. On this occasion, we again express our thanks and acknowledgement to our observers. In 2002 the data logger at the water gauging station Kal-Koritnica on the Koritnica River had already been successfully operating for most of the year. At the remaining 121 water gauging stations, water level oscillations were registered by water level recorders. Due to the control of their operations, the presence of observers is important there as well. At the same time, the observers represent a live connection with the department for hydrology forecasting.

Compared to the 2001 Hydrological Yearbook of Slovenia, new data has been presented for the water gauging stations Iška vas on the Iška River (code 5452), Log pod Mangartom on the Koritnica River (code 8230) and Robič on the Nadiža River (code 8730), while no data is available for the previously mentioned Cankova and Rožni Vrh, or for the closed water gauging stations Sodna vas I on the Mestinjščica River (code 4760) and Iška on the Iška River (5420). The closure of both was planned due to the choice of more adequate measuring cross-sections.

The discharges for 149 water gauging stations were defined from the water levels and rating curves. Again, discharges at the water gauging station Celje II – bridge (code 6140) on the Savinja River are presented. They had not been measured for five years due to disturbances caused by the effects

krivulji je imela Sava v Čatežu letno konico (Qvk) 12. avgusta, ko je dosegla pretok 1324 m^3/s . To je bil v letu 2002 največji zabeležen pretok na slovenskih rekah. Zelo verjetno se je konec novembra tej vrednosti močno približal tudi pretok Drave pri vtoku v akumulacijsko jezero pri Ormožu, kjer pa meritev ne opravljamo.

Temperaturo vode objavljamo za 45 merilnih mest. Na štirih vodomernih postajah so opazovalci redno zajemali vzorce za določanje premeščanja suspendiranega materiala. Na vodomerni postaji Suha na Sori pa smo začeli zajemati vzorce za določanje koncentracij suspendiranega materiala z avtomatskim vzorčevalnikom.

V mreži za meritve podzemnih voda je sprememb glede na preteklo leto manj. Prenehali smo objavljati podatke merilnega mesta V-1779 Mavčiče, saj so že leto poprej stekla opazovanja na nadomestni lokaciji. Tako so v letopisu objavljeni podatki 129 postaj. Na dveh je namesto občasnih opazovanj steklo zvezno spremljanje spreminjanja gladine podzemne vode z limnigrafom (3552 Murski Petrovci na Prekmurskem polju, S-1364 Spodnja Senica na Sorškem polju). Podatkovni zapisovalniki so delovali na šestih merilnih mestih. Trije vodnjaki na osrednjem delu Dravskega polja (1030 Dobrovce, 1710 Brunšvik, 1600 Zgornje Jablane) ter eden na Ptujskem polju (0240 Stojnci), ki so presahnili že v letu 2001, so bili suhi celo leto oziroma se je voda v njih pojavila šele v decembru. Za nekaj časa je presahnilo še nekaj vodnjakov na Prekmurskem (2630 Bakovci, 0850 Renkovci), Dravskem (2412 Kungota) in celo Kranjskem polju (0280 Cerklje) ter v Spodnji Vipavski dolini (0420 Orehovlje). Če bomo želeli podatkovne nize na teh delih vodonosnikov nadaljevati, bo potrebno vodnjake poglobiti ali poiskati nadomestne. V letošnjem letu so opazovanja gladin podzemne vode nemoteno potekala na merilnem mestu 0300 v Žepovcih na Apaškem polju, kjer je bil vodnjak poglobljen.

V okviru monitoringa izvirov sta delovali vodomerni postaji Podroteja in Divje jezero na kraških izvirih ob zgornji Idrijci in Izvir na Kamniški Bistrici. Opremljene so s podatkovnimi zapisovalniki. Na Divjem jezeru ga je v letu 2001 preplavila visoka voda, januarja 2002 pa je bil ponovno postavljen. Postaj monitoringa izvirov ne nadzorujejo prostovoljni opazovalci, zato težav v njihovem delovanju ne moremo vedno dovolj hitro zaznati in odpraviti. Zato so bile na Kamniški Bistrici in v Podroteji meritve občasno prekinjene.

Mareografski postaji Luka Koper in Luška Kapitanija sta beležili nihanje gladine morja brez večjih motenj. Ob koncu leta je bila mareografska postaja Luška Kapitanija vključena v projekt razvoja raziskovalne infrastrukture Evropske službe za viši-

of dams some hundred meters up and downstream from the measuring cross-section.

In 2002 983 hydrometric measurements were made. Among these, the greatest discharge measured was on the Sava River at Čatež on the 25th October (957 m^3/s at a mean speed of 2.45 m/s). According to the rating curve, the Sava River at Čatež had an annual peak (Qvk) on the 12th August, when it reached a discharge of 1324 m^3/s. This was the largest recorded discharge on the Slovenian rivers in 2002. This value was most likely very closely matched by the discharge of the Drava River at the inflow into the accumulation lake at Ormož at the end of November. However, measurements are not performed there.

The water temperatures for 45 measuring locations are presented. At four gauging stations, observers regularly collect samples for determining the transport of suspended material. At the water gauging station Suha on the Sora River, we began collecting samples for determining the concentrations of suspended material with an automatic sampler.

Compared to the year before, there are fewer changes in the groundwater monitoring network. We ceased to present data from the station V-1779 Mavčiče, because observations at the substitute location had already started a year before. Thus, the data for 129 stations are presented in the yearbook. At two of them, instead of periodic observations, continuous groundwater level measurements with a water level recorder were started (3552 Murski Petrovci at Prekmurje Plain and S-1364 Spodnja Senica at Sora Plain). Data loggers were in operation at six measuring places. Three wells in the central part of the Drava Plain (1030 Dobrovce, 1710 Brunšvik and 1600 Zgornje Jablane) and one in the Ptuj Plain (0240 Stojnci), which had already dried up in 2001, remained dry all the year, i.e. the water in them appeared only in December. For a time, several more wells also dried up in the Prekmurje Plain (2630 Bakovci and 0850 Renkovci), the Drava Plain (2412 Kungota) and even in the Kranj Plain (0280 Cerklje) as well as in the Lower Vipava Valley (0420 Orehovlje). If we want to continue gathering data sets at these parts of the aquifers, it will be necessary to deepen the wells or to find substitute ones. This year, the observation of ground water levels has been taking place without disturbance at the gauging place 0300 at Žepovci in the Apače Plain, where the well was deepened.

The Podroteja and Divje jezero water gauging stations on the karst springs along the upper Idrijca River, as well as Izvir on the Kamniška Bistrica River operated according to the program of monitoring of the springs. They are equipped with data loggers. At the lake, Divje jezero, the data logger had

ne morja (ESEAS). V skladu s cilji projekta bo postaja posodobljena, njeni podatki pa bodo vključeni v mednarodno izmenjavo podatkov o višinah gladin morja.

been flooded by high water in 2001, but was rebuilt in January 2002. The stations for monitoring springs are not supervised by voluntary observers, which is why the detection and the repair of defects in their operation is not always fast enough. That lead to a temporary suspension of measurements on the Kamniška Bistrica River and at Podroteja.

The mareographic stations Luka Koper and Luška Kapitanija recorded the oscillation of the sea level without any major disturbances. At the end of the year, the mareographic station Luška Kapitanija was included in the project of developing the research infrastructure of the European Sea Level Service (ESEAS). In accordance with the project objectives, the station will be refurbished and upgraded, while its data will be included into an international system for the exchange of data on sea levels.

Hidrometrična meritev na vodomerni postaji Radenci na Kolpi 4. junij 2002.
(foto: Mihael Tominc)
Hydrometric measurement at the gauging station Radenci on the Kolpa River on the 4th June 2002.
(photo: Mihael Tominc)