



REPUBLIKA SLOVENIJA
MINISTRSTVO ZA OKOLJE IN PROSTOR
AGENCIJA REPUBLIKE SLOVENIJE ZA OKOLJE



HIDROLOŠKI LETOPIS SLOVENIJE 2008

THE 2008 HYDROLOGICAL YEARBOOK OF SLOVENIA

LETNIK 19
YEAR 19

Ljubljana, 2010

HIDROLOŠKI LETOPIS SLOVENIJE 2008
THE 2008 HYDROLOGICAL YEARBOOK OF SLOVENIA

IZDAJATELJ – PUBLISHED BY

Ministrstvo za okolje in prostor – Ministry of the Environment and Spatial Planning
Agencija Republike Slovenije za okolje – Environmental Agency of the Republic of Slovenia
Vojkova 1b, Ljubljana
<http://www.arso.gov.si>

GLAVNA UREDNICA – CHIEF EDITOR

dr. Mira Kobold

UREDNIŠKI ODBOR - EDITORIAL BOARD

dr. Mira Kobold, mag. Jože Uhan, mag. Roman Trček, Jože Knez

TEHNIČNI UREDNIK – TECHNICAL EDITOR

mag. Florjana Ulaga

KARTOGRAFIJA – CARTOGRAPHY

Peter Frantar

AVTORJI BESEDIL – MAIN AUTHORS

mag. Marjan Bat, Peter Frantar, dr. Mira Kobold, Jože Miklavčič, Urša Pavlič, Janez Polajnar,
Igor Strojani, mag. Roman Trček, Niko Trišič, mag. Florjana Ulaga, Barbara Vodenik

LEKTORIRANJE SLOVENSKEGA BESEDILA - PROOFREADING OF SLOVENIAN TEXT:

Generalni sekretariat Vlade Republike Slovenije / Secretariat General of the Government of the Republic of Slovenia

PREVOD IN LEKTORIRANJE ANGLEŠKEGA BESEDILA - TRANSLATION AND PROOFREADING OF ENGLISH TEXT:

Skrivanek prevajalske storitve d.o.o.

ISSN 1318 - 5195

Hidrološki letopis Slovenije 2008
Agencija RS za okolje, 2010

VSEBINA

Predgovor

I. DEL: RAZVOJ NA PODROČJU HIDROLOŠKEGA MONITORINGA.....	1
Spremembe v mreži hidroloških merilnih mest v letu 2008 (mag. Roman Trček)	
Seznam opazovalcev v mreži merilnih mest hidrološkega monitoringa	
HIDROLOG – nov informacijski sistem državne hidrološke službe (mag. Marjan Bat, Jože Miklavčič)	
Premeščanje suspendiranih snovi v slovenskih rekah (mag. Florjana Ulaga)	
II. DEL: PREGLED HIDROLOŠKIH RAZMER V LETU 2008.....	25
Podnebne značilnosti leta 2008 (mag. Florjana Ulaga)	
A. POVRŠINSKE VODE.....	33
Vodostaji in pretoki rek (Igor Strojan)	
Visoke vode rek in poplave (Janez Polajnar)	
Nizke vode rek in hidrološka suša (dr. Mira Kobold)	
Temperature rek in jezer (Barbara Vodenik)	
Vsebnost in premeščanje suspendiranega materiala v rekah (mag. Florjana Ulaga)	
B. PODZEMNE VODE.....	61
Stanje zalog podzemne vode v aluvialnih vodonosnikih v letu 2008 (Urša Pavlič)	
C. IZVIRI.....	71
Monitoring izvirov (Niko Trišič)	
D. MORJE.....	89
Plimovanje morja (Igor Strojan)	
E. VODNA BILANCA.....	96
Vodna bilanca porečij v letu 2008 (Peter Frantar)	
III. DEL: PREGLEDNICE S PODATKI	
Pojasnila k preglednicam	
A. POVRŠINSKE VODE	
A.1. Seznam vodomernih postaj za površinske vode	
A.2. Seznam meritev pretokov	
A.3. Mesečni in letni srednji vodostaji s konicami	
A.4. Mesečni in letni srednji pretoki s konicami	
A.5. Mesečne in letne srednje temperature vode s konicami	
B. PODZEMNE VODE	
B.1. Seznam postaj za podzemne vode	
B.2. Mesečni in letni srednji vodostaji s konicami	
C. IZVIRI	
C.1. Seznam vodomernih postaj na izviroh	
C.2. Mesečni in letni srednji vodostaji s konicami	
C.3. Mesečni in letni srednji pretoki s konicami	
C.4. Mesečne in letne srednje temperature vode s konicami	
C.5. Mesečne in letne srednje specifične električne prevodnosti vode s konicami	
D. MORJE	
D.1. Čas in višina visokih in nizkih voda – dnevne vrednosti	
D.2. Mesečne in letne srednje višine visokih in nizkih voda in njihove amplitude...	
D.3. Dnevne in mesečne srednje višine gladine morja	
D.4. Mesečne in letne skrajne višine gladine morja	
IV. DEL: KARTOGRAFSKI PRIKAZI	
A. Mreža vodomernih postaj za površinske vode in morje v letu 2008	
B. Mreža postaj za podzemne vode in izvire v letu 2008	

CONTENTS

Foreword

Part I: DEVELOPMENTS IN THE FIELD OF HYDROLOGICAL MONITORING	1
Changes to the network of hydrological monitoring gauging stations (Roman Trček, MSc)	
The list of observers in the network of the hydrological gauging stations	
HIDROLOG (Hydrologist) – new information system of the national hydrology service (Marjan Bat, MSc, Jože Miklavčič)	
Transportation of suspended material in Slovenian rivers (Florjana Ulaga, MSc)	
Part II: A REVIEW OF HYDROLOGICAL CONDITIONS IN THE YEAR 2008	25
2008 Climate conditions (Florjana Ulaga, MSc)	
A. SURFACE WATERS	33
Water levels and discharges (Igor Strojjan)	
River high waters and floods (Janez Polajnar)	
River low waters and hydrological drought (Mira Kobold, PhD)	
Temperatures of rivers and lakes (Barbara Vodenik)	
Concentration and transport of suspended material in rivers (Florjana Ulaga, MSc)	
B. GROUNDWATERS	61
Groundwater storage in alluvial aquifers in 2008 (Urška Pavlič)	
C. SPRINGS	71
Springs monitoring (Niko Trišič)	
D. SEA	89
Sea tides (Igor Strojjan)	
E. WATER BALANCE	96
Water balance of the river basins (Peter Frantar)	
Part III: DATA TABLES	
Explanation to the tables	
A. SURFACE WATERS	
A.1. The list of surface water gauging stations	
A.2. The list of regular discharge measurements	
A.3. Monthly and annual mean water levels with extremes	
A.4. Monthly and annual mean discharges with extremes	
A.5. Monthly and annual mean water temperatures with extremes	
B. GROUNDWATERS	
B.1. The list of groundwater observation wells	
B.2. Monthly and annual mean water levels with extremes	
C. SPRINGS	
C.1. The list of gauging stations of the springs monitoring	
C.2. Monthly and annual mean water levels with extremes	
C.3. Monthly and annual mean discharges with extremes	
C.4. Monthly and annual mean water temperatures with extremes	
C.5. Monthly and annual mean values of the specific electrical conductivity with extremes	
D. SEA	
D.1. Times and heights of high and low waters – daily values	
D.2. Monthly and annual mean high and low waters and their amplitudes	
D.3. Daily and monthly mean water heights	
D.4. Monthly and annual extreme high and low waters	
Part IV: CARTOGRAPHIC PRESENTATION	
A. The Network of Gauging Stations on Surface Waters and Sea (2008)	
B. Groundwater and Spring Observation Network (2008).	

PREDGOVOR

Pred vami je letnik 19 hidrološkega letopisa Agencije RS za okolje. Glavni namen izdajanja hidrološkega letopisa ostaja objava rezultatov letnih meritev iz hidrološke merilne mreže in pregled hidroloških razmer v obravnavanem letu. Prikazane so vse hidrološke spremenljivke, ki so bile izmerjene v državni mreži hidroloških postaj na površinskih in podzemnih vodah, na izvirih in v morju Agencije Republike Slovenije za okolje.

Hidrološki letopis je vsebinsko dopolnjen s strokovnimi in analitičnimi vsebinami, s katerimi zaokrožujemo področja dela v sektorjih, ki zajemajo naloge hidrološke službe na Agenciji Republike Slovenije za okolje. Poleg pregleda hidroloških razmer obravnavanega leta želimo bralce seznaniti z razvojnimi nalogami s področja hidrologije na agenciji ter s postopno nadgradnjo in modernizacijo merilnih mest.

Podatki za to številko letopisa so bili v celoti obdelani in pripravljene iz novega hidrološkega informacijskega sistema HIDROLOG, ki je nadomestil štiri ločene podsisteme državne merilne mreže za površinske vode, podzemne vode, izvire in morje. Sistem je zasnovan kot spletna aplikacija z grafično podporo in podatkovno zbirko v bazi Oracle. Uporabnikom hidroloških podatkov je tako omogočen učinkovit dostop do hidroloških podatkov na spletni strani agencije (<http://www.arso.gov.si/vode/podatki/>). Po drugi strani se časovni zamik med meritvami in verifikacijo oziroma objavo podatkov na spletni strani agencije in v Hidrološkem letopisu skrajšuje. V tej številki letopisa nismo natisnili tabelaričnih letnih pregledov hidroloških parametrov, podatki z vseh hidroloških postaj, delujočih v letu 2008, pa so v celoti zapisani na priloženi zgoščenki.

Leto 2008 si bomo zapomnili predvsem po poletnih močnih neurjih in hudourniških poplavah ter decembrskih visokih vodah. Gladina morja je 1. decembra ob visoki plimi dosegla drugo najvišjo izmerjeno višino v opazovalnem obdobju zadnjih petdeset let. Povprečna letna vodnatost rek je bila zelo podobna povprečni vodnatosti v dolgoletnem primerjalnem obdobju. Temperatura vode so bile nekoliko nad dolgoletnim povprečjem. V aluvialnih vodonosnikih je prevladovalo običajno do nizko vodno stanje.

FOREWORD

Here we introduce Year 19 of the Hydrological Yearbook issued by the Environmental Agency of the Republic of Slovenia. The main purpose of issuing the hydrological yearbook remains the presentation of annual results to the public through measurements of the network of hydrological gauging stations and the review of hydrological conditions in the observed year. All hydrological variables measured within the national network of hydrological gauging stations in surface waters and groundwaters, at springs and in the sea by the Environmental Agency of the Republic of Slovenia have been demonstrated.

The contents of the hydrological yearbook are updated with expert and analytical topics that round off the different areas of work in the various sectors dealing with the tasks of the national hydrological service at the Environmental Agency of the Republic of Slovenia. In addition to reviewing hydrological conditions in the observed year, our purpose is also to familiarise readers with the hydrological development tasks at the Agency and with the gradual upgrading and modernisation of gauging sites.

Data for this yearbook issue was completely processed and prepared from the new hydrological information system HIDROLOG, which replaced four separate subsystems of the national network of gauging stations for surface water, groundwater, springs and sea. The system is designed as a web application with graphic support and database in Oracle RDBMS. Hydrological data users are therefore enabled simple access to hydrological data through the Agency's website (<http://www.arso.gov.si/vode/podatki/>). Moreover, the time delay between the measurements and the verification or publication of data on the Agency's website and in the Hydrological Yearbook is becoming shorter. This yearbook issue does not include printed tabular annual reviews of hydrological parameters but instead the data gathered from all hydrological stations operating in 2008 are fully recorded on the attached CD.

The year 2008 will be remembered mainly for the severe storms and torrential flooding in the summer in addition to the unforgettable December

Za izboljšanje opazovanj in dostopnosti podatkov je bilo v letu 2008 posodobljenih kar nekaj merilnih mest. Število samodejnih postaj iz leta v leto narašča, podatki pa so javnosti dostopni z majhno časovno zakasnitvijo na spletni strani agencije. Do leta 2015 sta v okviru projekta »Nadgradnja sistema za spremljanje in analiziranje stanja vodnega okolja v Sloveniji«, ki je financiran s sredstvi Kohezijskega sklada EU in lastnimi sredstvi RS, predvideni nadgradnja in posodobitev merilnih mrež za podzemne vode, površinske vode, meteorološke postaje in radar. Osnovni cilj projekta je zagotoviti zanesljive, kakovostne in prostorsko reprezentativne meteorološke in hidrološke meritve, ki bodo omogočile celovito spremljanje in analiziranje stanja vodnega okolja v Sloveniji ter natančnejše napovedovanje izrednih hidroloških pojavov. Celoten projekt je naravnano k zmanjšanju škodljivega delovanja voda ter vzpostavljanju trajnostnega razvoja vodnega okolja na ravni vse države.

Dr. Mira Kobold,
glavna urednica

high water levels. The sea level on 1 December at high tide reached the second highest recorded level within the observed period in the last 50 years. The average annual river stage was very similar to the average river stage during the multi-annual reference period. The water temperatures are slightly above the multi-annual average. The normal to low water level was prevalent in alluvial aquifers.

Several gauging sites were modernised in 2008 to improve observation and data access. The number of automatic stations is growing every year and the data is available to the public on the Agency's website with a short time delay. The upgrading and modernisation of the network of hydrological monitoring gauging stations for groundwater, surface water, meteorological stations and radar by 2015 has been projected within the project "Upgrading the system for monitoring and analysing the water environment status in Slovenia", financed by the EU Cohesion Fund and through the resources of the Republic of Slovenia. The primary objective of the project is to provide reliable, quality and spatially representative meteorological and hydrological measurements, which will enable comprehensive monitoring and analysing of the water environment conditions in Slovenia and more accurate forecasts of extreme hydrological events. The entire project is aimed at reducing the hazardous effects of water and establishing sustainable development of the water environment across the country.

Mira Kobold, PhD
Chief Editor