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water

MDPI

Supplementary material

Isotope composition of precipitation, groundwater, surface and lake waters from Plitvice Lakes, Croatia

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Table S1. Number of isotope data for precipitation, groundwater, surface water and lake waters from the Plitvice Lakes area.

Sample type	*n* (*A*)	*n* (δ^2H, δ^{18}O)	Period	Reference[2]
Precipitation	27	5	1978 – 1984	[36]
	37	38	2003 – 2006	-
Groundwater	95	17	1979 – 1984	[7,8]
	31	3	1985 – 1990	-
	17	-	2000 – 2015	-
		56	2003 - 2006	[10]
	-	9	2015 – 2018	-
Surface water	-	95 (δ^2H), 38 (δ^{18}O) [1]	2003 – 2006	[10]
	-	88	2011 – 2014	-
	9	-	2015	-
Lake water	-	44	2011 – 2014	-

[1] Number of δ^2H and δ^{18}O data is not equal.

[2] References given in the main text.

Table S2. Monthly precipitation amount *P*, mean monthly temperature *T* and isotope composition of precipitation ($\delta^{18}O$, $\delta^{2}H$, deuterium excess, tritium activity concentration *A*) at the Plitvice Lakes. Data from [7,10,36,45]. Shadowed rows indicate years with no data. Red fonts indicate extreme values of parameters in 2003 – 2006 period.

year	month	*P* (mm)	*T* (°C)	$\delta^{18}O$ (‰)	$\delta^{2}H$ (‰)	*d*-excess (‰)	*A* (^{3}H) (TU)
1978	1						
1978	2						
1978	3						
1978	4						
1978	5						
1978	6						
1978	7						101.6
1978	8						108.2
1978	9						
1978	10						
1978	11						
1978	12						
1980	1						
1980	2						
1980	3						
1980	4						
1980	5						
1980	6						
1980	7						33.9
1980	8						46.3
1980	9						32.6
1980	10						7.6
1980	11						10.4
1980	12						20.1
1981	1						20.8
1981	2						28.4
1981	3						41.3
1981	4						57.7
1981	5						44.3
1981	6						67.2
1981	7						60.5
1981	8						50.8
1981	9						40.1
1981	10						23
1981	11						20.4
1981	12						13.9
1982	1						18.2
1982	2						20.2
1982	3						32.6

year	month	*P* (mm)	*T* (°C)	$\delta^{18}O$ (‰)	$\delta^{2}H$ (‰)	*d*-excess (‰)	*A* (^{3}H) (TU)
1982	4						
1982	5						
1982	6						34.8
1982	7						
1982	8						
1982	9						
1982	10						
1982	11						
1982	12						
1983	1						
1983	2						
1983	3						
1983	4						
1983	5						
1983	6			-9.11	-61.7	11.18	
1983	7						
1983	8						
1983	9			-7.19	-46	11.52	
1983	10						
1983	11						
1983	12						
1984	1			-11.29	-80.4	9.92	18.8
1984	2			-13.14	-94.4	10.72	17.1
1984	3			-11.19	-80.6	8.92	17.9
1984	4						
1984	5						
1984	6						
1984	7						
1984	8						
1984	9						
1984	10						
1984	11						
1984	12						
2003	1	190.1	-1.6				
2003	2	72.6	-4.3				
2003	3	65.5	3.9				
2003	4	90.3	8.1				
2003	5	77.5	15.8				
2003	6	58.8	19.9				
2003	7	17.5	20.1	-5.31	-32.80	9.68	7.5
2003	8	32.6	21.7	-4.13	-22.30	10.74	7.2
2003	9	186.4	12.2	-9.30	-56.90	17.5	4.1
2003	10	251.5	7.8	-10.69	-72.60	12.92	1.9
2003	11	101.9	6.6	-8.52	-53.50	14.66	1.8

year	month	*P* (mm)	*T* (°C)	$\delta^{18}O$ (‰)	$\delta^{2}H$ (‰)	*d*-excess (‰)	*A* (^{3}H) (TU)
2003	12	61.1	0.7	-11.88	-80.20	14.84	1.9
2004	1	141.6	-2.0	-13.46	-100.00	7.68	1.8
2004	2	196.4	0.9	-13.60	-95.40	13.4	2.5
2004	3	154.5	1.8	-14.81	-106.50	11.98	3.7
2004	4	210.1		-10.08	-69.40	11.24	8.2
2004	5	147.3	11.1	-7.05	-44.40	12	6.3
2004	6	158.9	15.7	-7.82	-50.80	11.76	11.9
2004	7	71.9	17.9	-7.07	-45.40	11.16	
2004	8	61.6	18.2	-6.36	-38.00	12.88	17.2
2004	9	170.7	12.8	-8.33	-51.20	15.44	5.5
2004	10	153.5	12.7	-7.54	-45.20	15.12	4.2
2004	11	184.9	4.5	-11.33	-76.50	14.14	4.3
2004	12	183.6	0.5	-8.76	-53.10	16.98	3.4
2005	1	146.5	-0.8	-16.35	-112.90	17.9	6.6
2005	2	160.5	-4.1	-18.32	-132.40	14.16	8.2
2005	3	130.6	1.5	-13.76	-94.20	15.88	7.2
2005	4	197.8	8.5	-9.24	-57.60	16.28	8.9
2005	5	138.3	13.0	-7.48	-46.60	13.2	9.4
2005	6	114.2	16.3	-7.52	-47.40	12.76	10.5
2005	7	165.4	18.3	-8.66	-55.88	13.4	14.3
2005	8	335.6	15.7	-7.80	-48.01	14.39	12.5
2005	9	222.1	14.0	-10.42	-69.28	14.08	11.3
2005	10	103.2	9.7	-8.25	-49.63	16.37	9.8
2005	11	136.8	4.3	-11.39	-73.3	17.82	3.7
2005	12	221.3		-13.80	-97.27	13.13	5.2
2006	1						
2006	2			-14.06	-98.3	14.18	6.8
2006	3	170.3		-11.96	-81.11	14.57	4.6
2006	4			-9.68	-62.98	14.46	8.5
2006	5	147.3	12.8	-10.00	-66.46	13.54	6.0
2006	6	128.3	16.6	-11.62	-76.52	16.44	18.4
2006	7	96.4	19.0	-5.75	-33.32	12.68	18.8
2006	8	198.0	15.8	-8.62	-54.24	14.72	7.3
2006	9	51.0	14.6	-5.79	-30.72	15.6	3.1
2006	10	9.2	11.9				
2006	11	121.6	7.6				
2006	12	69.0	3.4				

Table S3. Basic statistics (mean values and standard deviations, minimum, median and maximum values) for $\delta^{18}O$ (shadowed rows) and $\delta^{2}H$ in lake waters (IRB1, IRB2, IRB3, IRB4) and surface waters (Ma, LP, LC, LB, BW, KzB, KoS, KoB), 2011 – 2014 period. *n* – number of data, *SD* – standard deviation.

Location / Code	Isotope	*n*	Mean	*SD*	Minimum	Median	Maximum
IRB3	$\delta^{18}O$	11	-10.48	0.34	-10.87	-10.53	-9.64
IRB3	$\delta^{2}H$	11	-70.42	2.41	-73.3	-70.57	-64.47
IRB4	$\delta^{18}O$	10	-10.48	0.27	-10.84	-10.51	-10.06
IRB4	$\delta^{2}H$	10	-70.62	1.70	-73.20	-70.58	-67.79
IRB1	$\delta^{18}O$	13	-10.39	0.30	-10.87	-10.36	-9.95
IRB1	$\delta^{2}H$	13	-70.12	1.94	-73.30	-69.75	-67.11
IRB2	$\delta^{18}O$	8	-10.27	0.41	-10.84	-10.36	-9.66
IRB2	$\delta^{2}H$	8	-69.26	1.89	-72.77	-69.21	-66.57
Matica	$\delta^{18}O$	12	-10.67	0.10	-10.86	-10.69	-10.53
Ma	$\delta^{2}H$	12	-71.40	1.10	-73.52	-71.55	-70.0
Lake Prošćansko	$\delta^{18}O$	12	-10.53	0.21	-10.82	-10.54	-10.11
LP	$\delta^{2}H$	12	-70.57	1.68	-73.49	-70.34	-67.77
Lake Ciginovac	$\delta^{18}O$	11	-10.45	0.31	-10.89	-10.5	-9.9
LC	$\delta^{2}H$	11	-70.45	2.07	-73.52	-70.73	-66.76
Lake Burget	$\delta^{18}O$	11	-10.44	0.27	-10.83	-10.48	-9.91
LB	$\delta^{2}H$	11	-70.37	1.95	-73.24	-70.31	-66.7
Burget - waterfall	$\delta^{18}O$	12	-10.41	0.29	-10.82	-10.46	-9.86
BW	$\delta^{2}H$	12	-70.25	2.08	-73.72	-70.64	-66.73
Lake Kozjak - bridges	$\delta^{18}O$	12	-10.34	0.32	-10.81	-10.37	-9.76
KzB	$\delta^{2}H$	12	-69.98	1.95	-72.95	-70.06	-66.49
Korana R. Sastavci	$\delta^{18}O$	7	-10.33	0.24	-10.67	-10.44	-9.98
KoS	$\delta^{2}H$	7	-69.04	1.71	-70.61	-69.87	-66.64
Korana R. - bridge	$\delta^{18}O$	10	-10.41	0.31	-10.94	-10.43	-10.01
KoB	$\delta^{2}H$	10	-70.34	2.21	-74.42	-70.09	-67.38

Table S4. Slopes and intercepts of relations δ^2H *vs.* $\delta^{18}O$ at individual sampling locations of lake waters from traps (IRB1, IRB2, IRB3, IRB4) and surface waters (Ma, LP, LC, LB, BW, KzB, KoS, KoB), 2011 – 2014 period.

Location Code	Slope	Intercept	*n*	*r*
IRB3	6.94 ± 0.42	2.3 ± 4.4	11	0.98
IRB4	5.86 ± 0.73	-9.2 ± 7.6	10	0.94
IRB1	6.22 ± 0.55	-5.4 ± 5.7	13	0.96
IRB2	4.42 ± 0.55	-23.9 ± 5.6	8	0.96
Ma	7.14 ± 2.5	4.8 ± 2.7	12	0.66
LP	7.70 ± 0.76	10.5 ± 8.0	12	0.96
LC	6.56 ± 0.38	-1.9 ± 4.0	11	0.98
LB	6.76 ± 0.75	0.3 ± 7.8	11	0.94
BW	7.31 ± 0.75	5.9 ± 7.8	12	0.95
KzB	6.02 ± 0.41	-7.7 ± 4.3	12	0.98
KoS	6.78 ± 1.1	1.1 ± 11.4	7	0.94
KoB	6.78 ± 0.7	0.3 ± 7.4	10	0.96

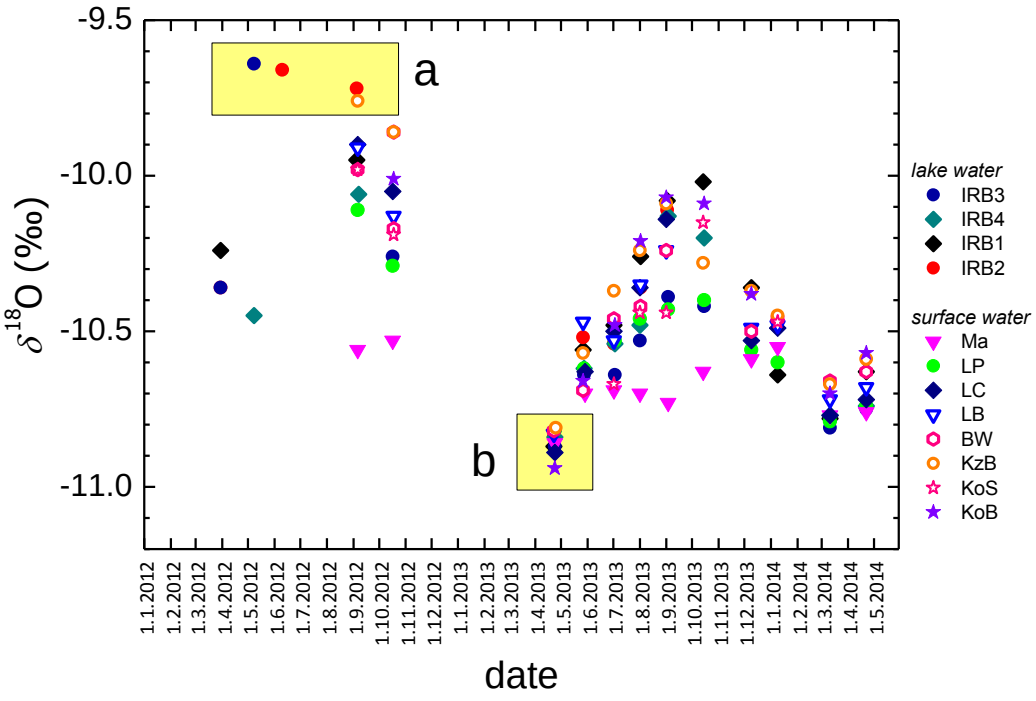


Figure S1. Seasonal variation in δ^2H of surface and lake waters, 2012 – 2014 period. Group **a**: after heavy summer rains; group **b**: after abundant winter precipitation and snow melting. For explanation of groups **a** and **b**, see text related to Figure 16.

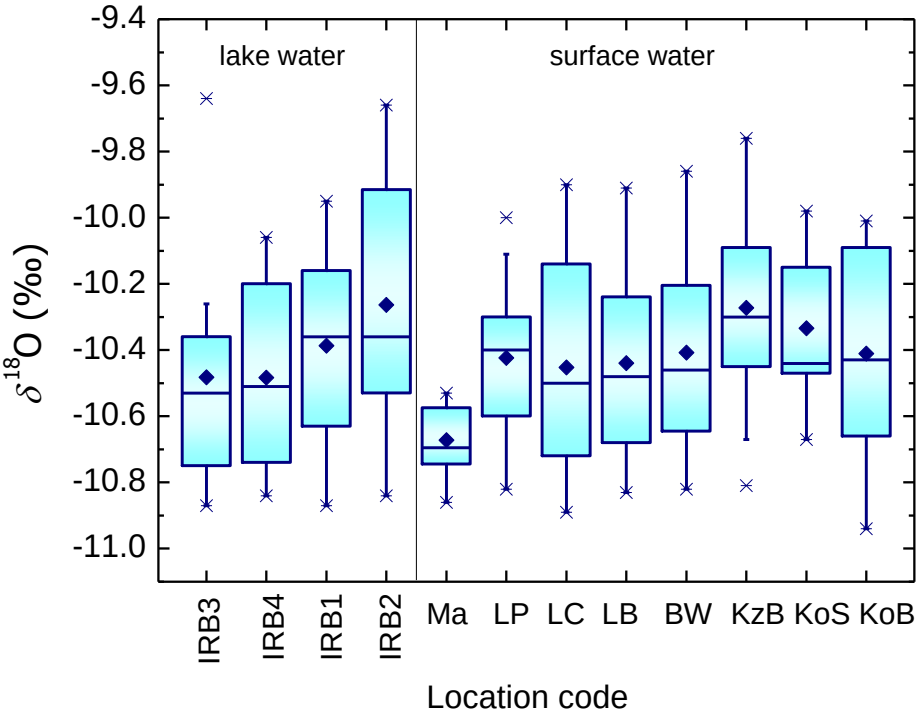


Figure S2. Box-plot of $\delta^{18}O$ values in lake and surface waters, sorted in downstream direction. Data from 2011 – 2014.

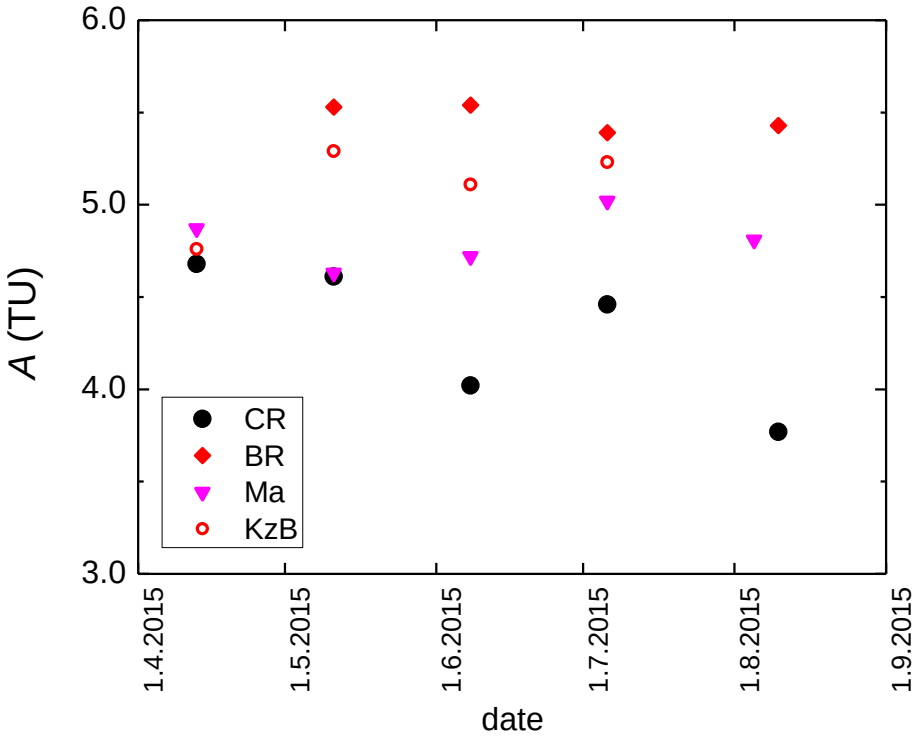


Figure S3. Tritium activity concentration in CR and BR springs and in surface water at locations Ma and KzB in 2015.

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