

SUPPLEMENTARY MATERIAL

Hydrogeochemical evidence of biotic over volcanic control in Lake Maninjau, Indonesia

Taofik Jasalesmana¹⁾ , Mutiara Rachmat Putri^{*2)} , Mirzam Abdurrahman³⁾ ,
Cynthia Henny⁴⁾ , Sulung Nomosatryo⁴⁾ 

¹⁾ Bandung Institute of Technology, Faculty of Earth Sciences and Technology, Earth Science Doctor Program, Jl. Ganesa No. 10 Coblong, 40132 Bandung, Jawa Barat, Indonesia

²⁾ Bandung Institute of Technology, Faculty of Earth Sciences and Technology, Research Group of Environmental and Applied Oceanography, Jl. Ganesa No. 10 Coblong, 40132 Bandung, Indonesia

³⁾ Bandung Institute of Technology, Faculty of Earth Sciences and Technology, Geological Engineering Study Program, Jl. Ganesa No. 10 Coblong, 40132 Bandung, Indonesia

⁴⁾ National Research and Innovation Agency (BRIN), Research Center for Limnology and Water Resources, Gedung B.J. Habibie, Jl. M.H. Thamrin No. 8, Jakarta Pusat 10340, Indonesia

* Corresponding author

Table S1. Tukey post hoc test results for temperature above and below the thermocline in November 2022 in the Lake Maninjau

Layer depth (m)	Comparison	Estimated difference	Lower end point of the interval	Upper end point of the interval	Adjusted <i>p</i>
≤2	DM2–DM1	0.0661	−0.3020	0.4342	0.9652
	DM3–DM1	0.5175	0.1494	0.8857	0.0023
	DM4–DM1	0.5900	0.2219	0.9581	0.0004
	DM3–DM2	0.4514	0.0833	0.8196	0.0099
	DM4–DM2	0.5239	0.1558	0.8920	0.0020
	DM4–DM3	0.0725	−0.2957	0.4406	0.9549
>2	DM2–DM1	−0.0067	−0.0092	−0.0042	0.0000
	DM3–DM1	0.0281	0.0257	0.0306	0.0000
	DM4–DM1	0.0311	0.0287	0.0335	0.0000
	DM3–DM2	0.0349	0.0332	0.0365	0.0000
	DM4–DM2	0.0378	0.0363	0.0394	0.0000
	DM4–DM3	0.0030	0.0015	0.0045	0.0000

Source: own study.

Table S2. Tukey post hoc test results for geochemical data above and below the thermocline in November 2022 and August 2023 in the Lake Maninjau

Survey	Parameter	Layer depth (m)	Estimated difference	Lower end point of the interval	Upper end point of the interval	Adjusted <i>p</i>	Comparison
November 2022	SO ₄ ²⁻	≤2	-0.43	-0.78	-0.08	0.025	DM2–DM1
	SO ₄ ²⁻	≤2	-0.105	-0.455	0.245	0.647	DM3–DM1
	SO ₄ ²⁻	≤2	-0.035	-0.385	0.315	0.974	DM4–DM1
	SO ₄ ²⁻	≤2	0.325	-0.025	0.675	0.063	DM3–DM2
	SO ₄ ²⁻	≤2	0.395	0.045	0.745	0.033	DM4–DM2
	SO ₄ ²⁻	≤2	0.07	-0.28	0.42	0.845	DM4–DM3
	HS ⁻	≤2	-0.142	-0.162	-0.122	0	DM2–DM1
	HS ⁻	≤2	-0.14	-0.16	-0.12	0	DM3–DM1
	HS ⁻	≤2	-0.138	-0.158	-0.117	0	DM4–DM1
	HS ⁻	≤2	0.002	-0.015	0.018	0.95	DM3–DM2
	HS ⁻	≤2	0.004	-0.012	0.021	0.609	DM4–DM2
	HS ⁻	≤2	0.003	-0.014	0.019	0.848	DM4–DM3
	Cl ⁻	>2	-0.997	-2.237	0.244	0.121	DM2–DM1
	Cl ⁻	>2	0.05	-1.19	1.29	0.999	DM3–DM1
	Cl ⁻	>2	0.723	-0.517	1.964	0.313	DM4–DM1
	Cl ⁻	>2	1.047	-0.194	2.287	0.101	DM3–DM2
	Cl ⁻	>2	1.72	0.48	2.96	0.009	DM4–DM2
	Cl ⁻	>2	0.673	-0.567	1.914	0.366	DM4–DM3
August 2023	SO ₄ ²⁻	>10	0.024	-0.026	0.075	0.191	DM2–DM1
	SO ₄ ²⁻	>10	-0.036	-0.087	0.014	0.093	DM3–DM1
	SO ₄ ²⁻	>10	-0.044	-0.102	0.015	0.087	DM4–DM1
	SO ₄ ²⁻	>10	-0.061	-0.102	-0.019	0.024	DM3–DM2
	SO ₄ ²⁻	>10	-0.068	-0.118	-0.017	0.028	DM4–DM2
	SO ₄ ²⁻	>10	-0.007	-0.058	0.043	0.777	DM4–DM3
	Cl ⁻	>10	0.131	0.022	0.239	0.035	DM2–DM1
	Cl ⁻	>10	0.123	0.014	0.231	0.039	DM3–DM1
	Cl ⁻	>10	0.125	0	0.25	0.05	DM4–DM1
	Cl ⁻	>10	-0.008	-0.096	0.08	0.915	DM3–DM2
	Cl ⁻	>10	-0.006	-0.114	0.103	0.981	DM4–DM2
	Cl ⁻	>10	0.003	-0.106	0.111	0.998	DM4–DM3

Explanation: yellow-highlighted cells indicate parameters differing significantly among stations ($p \leq 0.05$).

Source: own study.

Table S3. Profile of carbon (C), sulphur (S) in DM3 and DM1 sediment in the Lake Maninjau

Station	Depth (m)	C (%)	S (%)
DM1	0–2.0	8.0996	0.7067
	20.0–22.5	7.6872	1.0122
	25.0–27.5	5.8894	0.6813
DM3	0–2	n.d	n.d
	2–4	9.9188	1.4635
	4–6	10.7784	0.9181
	6–8	14.0797	1.6387
	8–10	8.9471	0.8722
	10–12	10.1639	0.992
	12–14	9.101	1.3126
	14–16	10.2608	1.4642

Explanation: n.d = no data.

Source: own study.

Table S4. Trace element concentrations in sediments from DM1 and DM3 stations in Lake Maninjau

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Element	Concentration in sediments in station in depth										
	station DM3								station DM1		
	1	3	5	7	9	11	13	15	1	21.25	26.25
W	0	0	0	0	0	0	0	0	0	0	0
Y	0	0	0	0	0	0	0	0	0	0	0
Yb	0	0	0	0	0	0	0	0	0	0	0
Zn	0	0	0	0	0	0	0	0	0.1	0	0
Zr	0	0	0	0	0	0	0	0	0	0	0

Explanation: yellow-highlighted cells indicate elements considered as geochemical indicators of volcanic activity.

Source: own study.

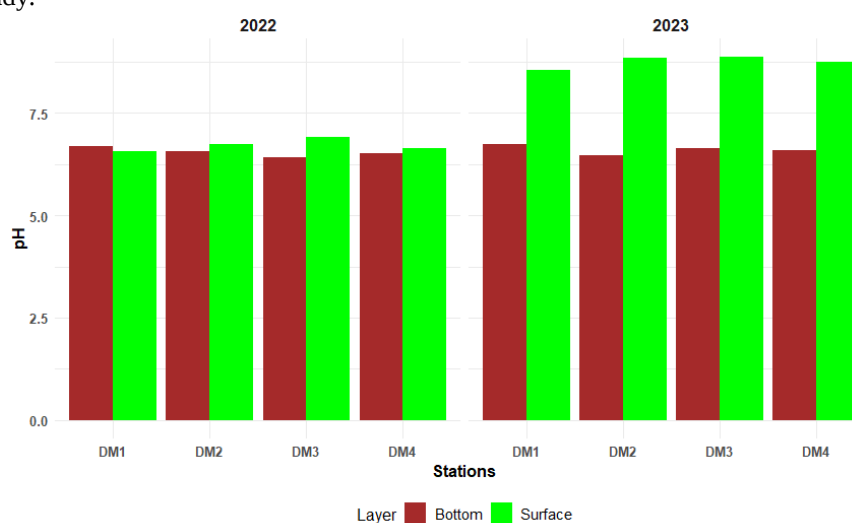


Fig. S1. The comparison between surface and bottom pH values in November 2022 and August 2023 in in the Lake Maninjau; source: own study

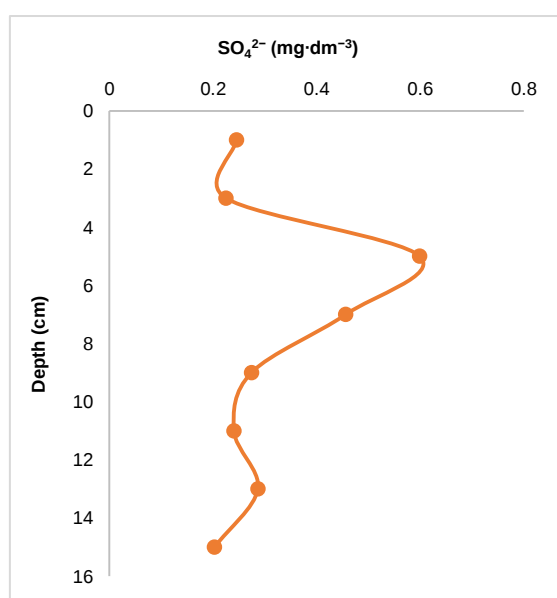


Fig. S2. Vertical profile of sulphate in the porewater of sediments in DM3 station; source: own study

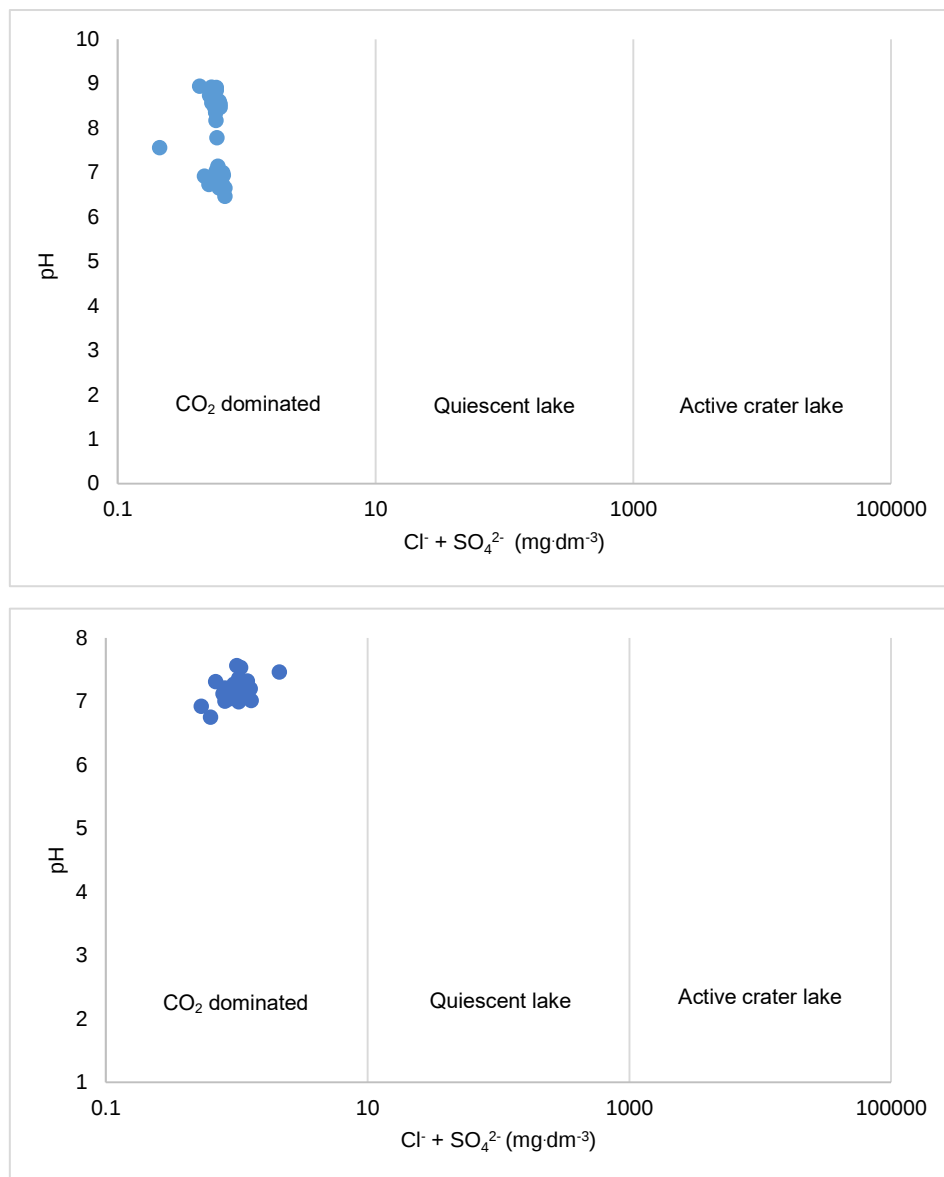


Fig. S3. Chemical properties of a) water column, b) porewater in August 2023; source: own study