

Table 1 Summary of geochemical parameters in groundwater samples collected from the three sites in the Ryukyu limestone aquifer in November and December 2021, and January 2022

Sampling site	Collection date	Groundwater level (m)	Water temperature (°C)	pH	EC (ms/cm)	ORP (mV)	DO	DOC	HCO ₃ ⁻	SS	T-P	PO ₄ -P	Cl (mg/L)	NO ₃ -N	SO ₄ ²⁻	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺
Site 1	Nov.2021	34.5	23.6	7.66	0.725	184	5.02	0.2744	227	10.2	0.03	0.03	52.3	9.1	71.3	35.5	2.5	9.7	87.6
	Dec.2021	34.5	23.6	6.82	0.723	197		0.8566	244.1	14.6	0.02	0.02	53.5	9.1	67.8	34.8	2.6	9.7	73.8
	Jan.2022	34.5	23.4	7.08	0.678	198		1.0572	251.4	0.0	0.02	0.02	47.8	8.1	58.6	31.5	2.8	8.5	105.1
	mean ± SD	34.5±0	25.3±0.09	7.19±0.35	0.709±0.02	193±6.37		0.7294±0.33	240.8±10.2	8.26±6.12	0.02±0.04	0.02±0.004	51.2±2.45	8.75±0.46	65.9±5.36	33.9±1.74	2.6±0.12	9.3±0.57	88.8±12.8
Site 2	Nov.2021	18.3	24.4	6.8	0.919	221	5.13	1.6096	263.6	0.6	0.02	0.02	56.8	20.4	110.5	48.7	4.1	21	103.3
	Dec.2021	18.3	23.9	6.88	0.931	194		0.7658	253.8	21.5	0.02	0.01	59.5	23.0	109.5	47.8	4.2	21.3	105.6
	Jan.2022	18.3	24.1	7.03	0.976	241		0.1911	253.8	0.0	0.02	0.01	58.2	24.6	109.7	47.7	4.4	20.5	127.8
	mean ± SD	18.3±0	24.1±0.10	6.9±0.1	0.942±0.02	218±19.3		0.8555±0.58	257±4.62	7.37±10	0.02±0	0.01±0.004	58.2±1.10	22.7±1.75	109.9±0.43	48.0±0.45	4.2±0.12	20.9±0.33	112±11
Site 3	Nov.2021	3.19	24.2	6.68	0.861	171	1.06	2.274	331.9	41.4	0.17	0.11	48.9	10.4	98.1	30.8	8.8	17.2	143.5
	Dec.2021	2.68	21.1	7.25	0.392	208		1.6124	158.7	21.4	0.17	0.09	29.6	6.8	33.5	13.6	8.1	6.9	50.0
	Jan.2022	1.19	20.3	7.4	0.369	230		0.2486	148.9	10.7	0.21	0.14	23.4	3.5	26.3	11.3	5.8	6.0	48.7
	mean ± SD	2.35±0.84	21.9±1.68	7.11±0.31	0.540±0.23	203±24.3		1.3783±0.84	213±84.1	24.5±12.7	0.18±0.02	0.11±0.02	34.0±10.9	6.89±2.80	52.6±32.3	18.6±8.7	7.6±1.28	10.0±5.08	80.7±44.4

Abbreviation used are : EC = electrical conductivity, ORP = oxidation reduction potential, DO = dissolved oxygen, DOC = dissolved organic carbon, SS = suspended substance, T-P = total phosphorus, PO4-P = dissolved phosphorus, NO3-N = nitrate nitrogen