Electronic supplementary material

Table S1:Hydrochemical compositions of the groundwater and surface water sources in Kubi and Ocho village during the 2021 sampling campaign. Note: BDL = below detection limit; NM = not measured, ionic concentrations, TDS and DO = mg/L; EC = μS/cm; Temp = ^{O}/C

Sample ID	Typology	Well depth	pH	Temp	EC	TDS	DO	DOC	Cl^-	SO_4^{2-}	NO_3^-	NO_3^-–N	HCO_3^-	Na^+	K^+	Mg^{2+}	Ca^{2+}
OKBH	Borehole	30	7.5	19	472	302.1	6.1	4.1	10.1	67.6	56.7	12.9	39.1	28.6	0.6	14.4	35.5
OKR1	River		7.9	24	274	175.4	9	3.8	7.4	36.8	20.9	4.8	61.2	14.4	2.4	7.8	23.2
OKR2	River		8.59	24.7	206	131.9	8.3	5.3	6.4	16.8	5.5	1.3	50.6	10.1	1.6	4.5	9.8
OKU1	Well	5.11	6.46	20.7	333	213.2	3.9	11.6	7	37.7	32.1	7.3	30.2	13.1	3.3	8.2	22.1
OKU2	Well	3.12	6.45	20.6	326	208.7	8.2	13.3	8.1	50.8	49.2	11.2	14.2	15.5	4.1	11.4	25.4
OKU3	Well	3.78	6.51	18.3	321	205.5	7.5	6	7.6	74.6	40.8	9.3	28.4	14.8	1.4	13.9	29.3
OKU4	Well	7.59	6.44	21.2	265	169.6	6.5	3.3	9.9	36.2	27.9	6.4	43.5	15.5	4.5	8.2	22
OKU5	Well	12.5	6.94	20.9	238	152.4	5.5	NM	11.7	26.3	22	5	43.5	17.5	1.7	5.4	18.5
OKU6	Well	70	6.89	18.3	465	297.6	4.7	4.8	10.7	64.1	57.2	13	62.1	27.9	0.8	14.4	38.1
OKU7	Well	4.68	6.49	24.3	407	260.5	3.8	4.1	6.5	34.3	13.7	3.1	121.6	9.8	6.6	9.7	30.1
OKU8	Well	4.46	6.41	21.7	255	163.2	4.9	3	9.5	37.6	28.6	6.5	47.1	13.4	4.1	8.9	23.7
OKU9	Well	5.71	6.74	24.9	106.3	68.1	8.6	2.5	9	5.1	2.1	0.5	55.9	9.6	1	1.6	7.8
OKU10	Well	5.65	6.5	20.6	226	144.7	3	3.6	4.2	13.6	10.4	2.4	57.7	6	4.9	4.2	13.6
OKU11	Well	1.2	6.68	26.7	354	226.6	3.9	3.7	14.3	51.5	54.9	12.5	0	14.4	5.4	15.3	BDL
OKD1	Well	NM	7.32	20.4	283	181.2	1.1	4.9	9.4	36.3	26.1	5.9	37.3	16.3	4.9	9.5	24
OKD2	Well	NM	7.09	20.6	418	267.6	2.8	4.9	10	41.2	42.8	9.7	70.1	19.3	0.8	11.2	27.3
OKD3	Well	3.72	7.16	22	378	242	3.8	2.8	11.1	38.2	33.5	7.6	47.1	16.4	7.1	10.8	27.9
OKD4	Well	4.35	6.4	20.4	261	167.1	4.6	4.6	8.7	32.6	28.5	6.5	24.9	11.7	4.7	8.5	21
OKD5	Well	6.76	NM	20.7	248	158.8	6	3.5	10.8	41.6	32	7.3	37.3	15.9	5.2	9.4	24.8
OKD6	Well	6.64	6.89	18.3	465	297.6	4.7	4.1	10.5	31.1	11.2	2.6	55.9	17.4	2.7	8.4	17.1
O-KUS	Spring		7.21	19.1	185.7	118.9	9.2	3.6	14.7	22.9	7.1	1.7	7.2	21	2.2	9.8	24.6
OG1	Well	2	6.72	23.6	266	170.3	0.8	6.7	8.4	11.3	3.5	0.8	89.8	12.2	2	5	13.9
OG2	Well		6.72	28.3	346	221.5	4.5	3.5	15.4	49	21.3	4.9	141.2	27.1	1.9	19.1	43.3
OG3	Well	3	6.64	22.6	239	153	3.1	3.4	13.6	22.8	11.6	2.7	98.7	20.6	8	8.9	29.7
OG4	Well	9	6.4	22.5	191.7	122.7	5.3	2.2	8	18.1	19.7	4.5	55.6	12.9	5.4	5.7	20.2

OG5	Well		5	6.53	20.4	229	146.6	2.3	2.2	11.8	39.5	13.5	3.1	55.2	20.1	3.6	9.1	21.3
OG6	Well			6.74	24.6	479	306.6	2.9	1.7	37.5	34.1	26.5	6	150.2	28.1	1.9	15.3	39.4
OG7	Well		5	6.52	19.2	373	238.8	4.9	3.2	13	47	48.8	11.1	75.7	18.6	0.7	13.9	29.1
OG8	Tap	NM		7.16	22.8	164.9	105.6	9.1	3.2	5.3	19.8	13.3	3.1	34	9.4	1	4.9	13.5
OG9	Well		4	6.34	22.4	237	151.7	3.4	7	9.7	14.2	22.1	5	51.3	9.5	4.8	5.1	14.2
OG10	Well		4	6.27	21	301	192.7	1.1	2.9	8.4	19.2	12.3	2.8	107	21.2	8.8	8	BDL
OG11	Well		5	6.19	19.6	453	290	2.8	4.4	17.9	145.1	66.4	15.1	54.1	57.6	2.2	22.2	42.8
OG12	Well		7	6.22	20.9	354	226.6	2.3	3	18.3	58.4	31.9	7.3	70.4	22.6	2.7	14.3	32.4
OG13	Well		6	6.44	23.1	378	242	1.7	4.8	14.6	84.3	19.2	4.4	82.3	15.8	7.2	11	48.1
OG14	Well		4	6.44	21.4	285	182.4	3.2	5	13.8	22.2	33.4	7.6	69	16.8	10.5	7.4	29.6
OG15	Well		4	6.57	22.6	269	172.2	3.2	4	7.9	14.6	16.1	3.7	105.1	11.1	5.5	5.4	24.5
OG16	Well		5	6.94	21.3	317	202.9	1.6	3.1	12	10.1	7.4	1.7	143.6	22.2	3.2	7.3	BDL
OG17	Well		2	7.08	20.6	340	217.6	8.2	4.1	5.1	46.4	28.5	6.5	78.9	15.3	0.7	11.4	27
OG18	Well		6	6.34	21.3	236	151.1	3.3	5.9	9.2	21.5	23.5	5.4	70.7	14.7	10.2	7.5	26.4
OG19	Well	NM		6.27	21.6	323	206.8	1.1	3.3	21.3	BDL	19.6	4.5	89.7	21.5	0.3	13.6	8.8
OG20	Well		5	6.89	23.5	318	203.6	1.7	4.9	10.9	26.4	11.2	2.6	133.2	19.3	6.1	7.8	BDL
OG21	Well		5	6.5	22.7	410	262.4	1.7	2.5	12	27	28	6.4	83.4	12.4	1.4	6.5	BDL
OG22	Spring			7.45	23.6	217	138.9	7.7	0	10.9	22.9	13.7	3.1	9.3	0	8.4	25.8	BDL
OG23	Spring			7.45	17.6	133	85.2	9.5	3.5	4.6	4.5	2.7	0.7	4	5.5	3.2	1.4	4.6
OG24	Well		5	6.83	22.2	331	211.9	3.6	2.8	13.7	71.4	41.9	9.5	8.9	21.5	4.7	16.8	45
OG25	Well		10	6.95	22.7	333	213.2	2.4	2.8	4.1	45	18.9	4.3	9.1	10.2	0.8	6.5	28.9
OG26	Well		4	6.74	21.6	210	134.4	7.5	-3.7	5.9	35.2	24.3	5.5	4.5	12	1.9	8.5	23.6
OG27	Well		5	6.58	23.3	324	207.4	3.4	2.5	11	74.2	12.5	2.9	12.8	22	4.8	22.1	50.8
OG28	Well		6	8.44	22.8	291	186.3	4.1	3.6	11.3	24.3	24.3	5.5	11.4	16.6	4.3	7.6	35.1
OG29	Well	NM		6.41	22.9	266	170.3	1.8	2.4	9.7	28.8	14.2	3.3	7	14.6	6.3	7.3	BDL
OG30	Well		4	6.76	21.8	347	222.1	2.1	3.6	6.6	21.7	10.1	2.3	10.5	12.4	2.7	5.7	18.7
OG31	Well		3	6.81	22.1	368	235.6	1.6	1.8	12.8	36.7	3.7	0.9	14	27.1	5.1	9.9	BDL
OG32	Well		3	7.1	21.9	275	176	8.1	2.2	6.4	22.9	21	4.8	8.5	11	4.3	5.9	23.3

Table S2: Correlation matrix of physiochemical data of groundwater samples collected from Kubi and Ocho village

	Kubi village (n=19)								
	NO_3^-–N	Cl^-	SO_4^{2-}	Na^+	K^+	Mg^{2+}	Ca^{2+}	EC	DOC
NO_3^-–N									
Cl^-	0.17								
SO_4^{2-}	.88**	0.15							
Na^+	.68**	.67**	.66**						
K^+	-0.18	-0.14	-0.45						
Mg^{2+}	.84**	0.38	.93**	.77**	-0.12				
Ca^{2+}	.80**	0.35	.85**	.74**	-0.02	.94**			
EC	.63**	0.11	.66**	.60**	-0.07	.73**	.71**		
DOC	0.37	-0.28	0.29	-0.02	-0.04	0.21	0.1	0.16	
	Ocho village (n=23)								
NO_3^-–N									
Cl^-	0.38								
SO_4^{2-}	.69**	0.33							
Na^+	.72**	.59**	.82**						
K^+	-0.08	0.00	-0.16	-0.12					
Mg^{2+}	.60**	.56**	.82**	.80**	-0.18				
Ca^{2+}	.48*	.54**	.74**	.62**	0.12	.85**			
EC	.60**	.67**	.67**	.66**	-0.27	.72**	.72**		
DOC	-0.03	-0.23	-0.12	-0.12	0.32	-0.26	-0.25	-0.16	

*Correlations significant at p = 0.05

**Correlation significant at p = 0.01

Table S3: Isotopic data (‰) of sampled groundwater in Kubi and Ocho village

	Kubi village				Ocho village			
Sample	Type	$\delta^{15}N-NO_3^-$	$\delta^{18}O-NO_3^-$	Sample	Type	$\delta^{15}N-NO_3^-$	$\delta^{18}O-NO_3^-$
OKR1	River	7.2	2.1	OG4	Well	9.9	2.6
OK BH	Borehole	6.5	1.2	OG6	Well	26	14.9
OKU2	Well	3.7	2.4	OG7	Well	6.6	1
OKU3	Well	5.1	0.8	OG11	Well	8.6	2.6
OKU5	Well	13.3	2.2	OG14	Well	15.2	3.3
OKU6	Well	6.8	1.4	OG17	Well	5.2	0.7
OKU11	Well	5.3	-1	OG21	Well	14.5	14.7
OKD2	Well	6.8	2.8	OG24	Well	12	7.7
OKD4	Well	6.5	1.4	OG26	Well	4.9	0.1
OKD5	Well	6.1	1.6	Min		4.9	0.1
Min		3.7	-1	Max		26	14.9
Max		13.3	2.8	Mean		11.4	5.3
Mean		6.7	1.5	STDev		6.7	5.9
STDEV		2.6	1.1				

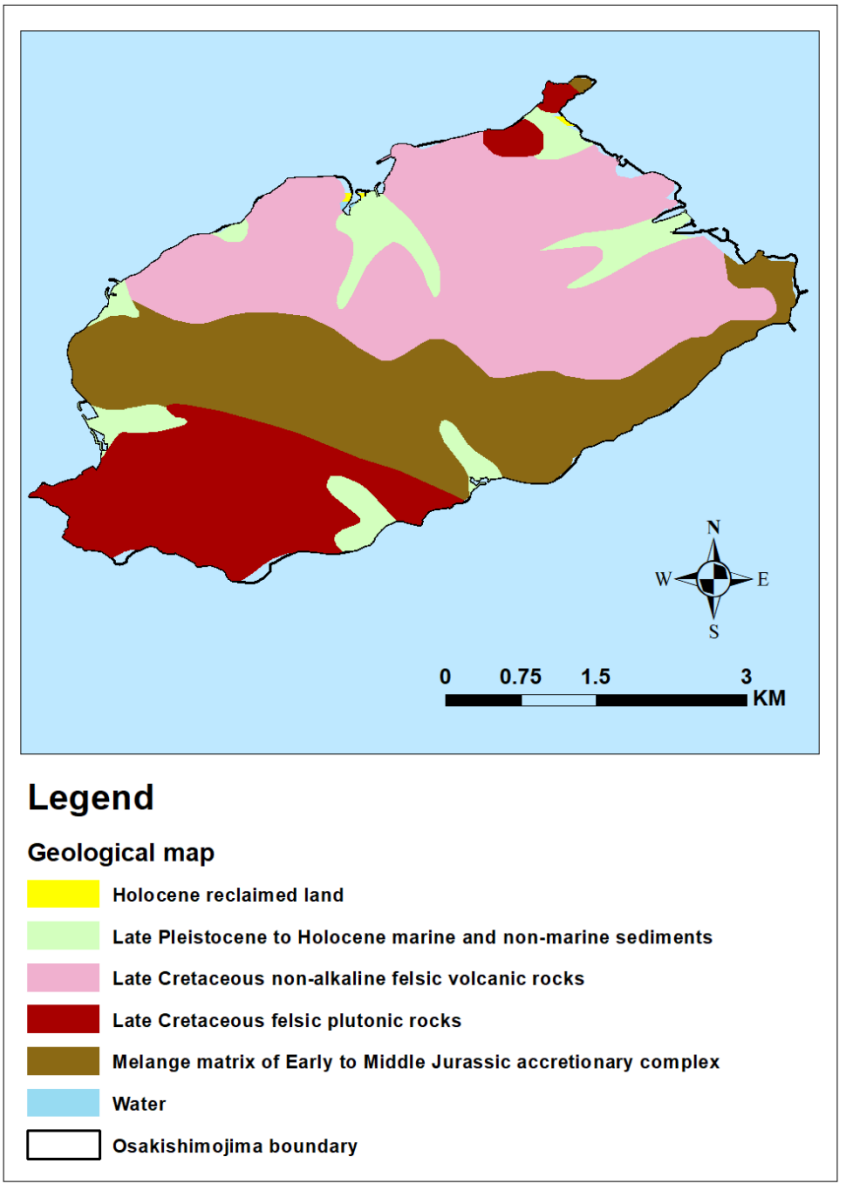

Figure S1:Outcrop geology of Osakishimojima Island