

Supplementary material for:

Analysis of Factors Involving Drinking Water Contamination by Glyphosate and/or Nitrate in Urban Areas

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Table SM 01 – Sampling frequency, 89 cities (Microsoft Excel® software, version 2019).

	Samples analyzed by month													
	Mar/2019	Apr/2019	May/2019	Jun/2019	Jul/2019	Aug/2019	Sep/2019	Oct/2019	Nov/2019	Dec/2019	Jan/2020	Feb/2020	Mar/2020	TOTAL
Altair	5	6	4	4	7	6	7	6	6	3	6	4	3	67
Altinópolis	2	2	2	2	2	2	2	2	2	2	2	2	0	24
Américo Brasiliense	2	2	2	2	2	2	2	8	2	2	2	2	2	32
Aramina	1	2	2	2	2	2	2	2	2	2	2	2	4	27
Araraquara	2	5	5	5	5	5	5	5	5	5	5	5	5	62
Barretos	0	16	16	13	16	16	16	13	16	9	10	16	16	173
Barrinha	0	9	9	2	2	2	9	9	9	2	9	3	0	65
Batatais	6	13	13	13	13	13	13	13	13	3	13	13	13	152
Bebedouro	2	5	5	5	6	6	6	6	6	6	6	6	7	72
Boa Esperança do Sul	2	2	2	2	2	0	0	7	6	2	2	2	2	31
Borborema	6	6	6	7	6	6	6	7	6	2	7	6	0	71
Brodowski	2	2	2	2	2	2	2	2	6	2	2	2	1	29
Buritizal	1	2	2	2	2	2	2	2	2	2	2	2	3	26
Caiobi	3	4	3	4	7	7	7	7	7	3	3	4	3	62
Caiuru	9	9	9	9	9	9	9	9	8	6	5	9	5	105
Cândido Rodrigues	3	4	3	4	0	4	3	0	0	0	0	0	0	21
Cássia dos Coqueiros	4	4	4	4	4	4	4	4	4	2	4	4	0	46
Colina	3	2	2	2	3	3	3	3	3	3	2	2	3	34
Colômbia	6	4	3	4	5	5	5	5	5	3	3	5	6	59
Cravinhos	0	2	2	3	2	2	2	3	2	2	2	2	9	33
Cristais Paulista	0	2	2	2	2	2	2	6	2	2	2	2	6	32
Descalvado	0	2	2	7	2	2	2	2	2	2	2	2	2	29
Dobrada	5	6	0	6	6	6	5	5	5	2	5	6	0	57
Dourado	2	0	4	2	0	2	4	0	7	2	2	0	2	27
Dumont	2	2	2	2	2	2	6	2	2	2	2	2	0	28
Gavião Peixoto	2	2	2	2	2	2	4	2	2	2	2	2	2	28
Guaiúra	6	9	9	9	9	9	9	9	9	3	9	9	9	108
Guará	7	7	7	7	7	7	7	2	7	2	7	2	0	69
Guaraci	8	9	9	7	7	10	7	7	7	3	7	4	6	91
Guariba	2	2	2	2	2	1	4	2	2	2	2	2	2	27
Guataporá	2	2	2	2	2	2	2	2	2	2	2	6	0	28
Ibaté	2	2	2	2	2	2	2	2	2	2	2	2	7	31
Ibitinga	10	9	10	9	2	9	4	9	4	4	10	4	10	94
Igarapava	5	10	10	10	10	10	10	10	10	2	10	6	10	113
Ipuã	1	2	2	2	2	2	4	2	2	2	2	5	1	29
Itápolis	8	8	9	8	8	8	2	8	8	2	9	2	0	80
Itirapuã	2	2	2	2	0	3	0	6	2	0	0	0	0	19
Ituverava	5	9	9	6	10	6	10	10	10	2	9	9	1	96
Jaborandi	3	3	3	3	3	3	3	3	3	3	3	3	3	39
Jaboticabal	7	13	13	13	13	13	11	14	13	13	13	13	6	155
Jardinópolis	2	2	2	2	2	2	2	2	2	2	2	2	9	33
Jeriquara	0	2	2	2	2	2	2	4	2	2	2	2	0	24
Luís Antônio	2	2	0	2	2	4	2	2	2	2	2	2	0	24
Matão	0	3	3	3	4	3	3	3	4	4	3	4	4	41
Miguelópolis	2	0	2	2	2	2	0	0	0	0	0	0	0	10
Monte Alto	2	0	4	0	2	2	2	2	4	2	2	2	2	26
Monte Azul Paulista	7	7	7	8	10	4	8	10	7	3	7	7	0	85
Morro Agudo	1	2	2	2	2	2	5	2	2	2	2	2	1	27
Motuca	0	4	3	4	4	3	4	4	4	2	4	3	0	39
Nova Europa	0	3	2	2	2	2	2	2	2	2	2	2	6	29
Nuporanga	2	2	2	3	2	2	2	2	2	2	2	2	6	31
Ólimpia	7	15	13	10	10	14	10	10	10	6	10	6	7	128
Orlândia	1	2	2	2	2	2	2	2	2	2	2	2	1	24
Patrocínio Paulista	2	2	2	2	2	2	4	3	2	2	2	4	4	33

Pedregulho	2	2	2	2	2	2	2	2	2	2	2	2	6	30
Pitangueiras	0	9	9	9	9	2	2	2	9	2	9	2	9	73
Pontal	2	2	2	2	2	2	2	2	2	2	2	2	9	33
Porto Ferreira	9	10	9	9	9	9	9	9	10	4	10	9	9	115
Pradópolis	0	2	2	2	2	2	2	2	7	2	2	2	2	29
Restinga	6	6	6	6	6	6	6	6	4	2	2	6	2	64

Table SM 01 (cont.) – Sampling Frequency, 89 cities (*Microsoft Excel®* software, version 2019).

	Samples analyzed by month														
	Mar/2019	Apr/2019	Mav/2019	Jun/2019	Jul/2019	Aug/2019	Sep/2019	Oct/2019	Nov/2019	Dec/2019	Jan/2020	Feb/2020	Mar/2020	TOTAL	
Ribeirão Bonito	0	2	2	2	2	2	2	2	2	2	2	2	5	27	
Ribeirão Corrente	0	2	2	2	2	2	2	2	2	2	4	4	4	30	
Ribeirão Preto	15	24	24	27	29	25	27	25	24	11	21	22	20	294	
Rifaina	0	2	2	2	0	2	4	8	2	2	4	2	0	30	
Rincão	2	0	5	2	2	2	6	2	2	0	2	2	0	27	
Sales Oliveira	2	2	2	2	2	2	2	2	2	2	2	2	0	24	
Santa Cruz da Esperança	2	0	0	4	4	2	4	2	2	2	4	2	2	30	
Santa Ernestina	5	6	5	2	5	6	0	6	5	0	2	2	0	44	
Santa Lúcia	2	2	2	2	2	2	2	6	2	2	2	2	2	30	
Santa Rita do Passa Quatro	0	9	9	9	9	9	2	9	9	2	9	9	9	94	
Santa Rosa de Viterbo	9	9	9	9	2	9	2	9	9	2	9	9	9	96	
Santo Antônio da Alegria	2	2	2	2	2	2	2	2	2	2	2	2	0	24	
São Carlos	4	4	4	5	4	4	4	4	4	4	7	4	4	56	
São Joaquim da Barra	1	2	2	2	2	2	2	3	2	2	2	2	1	25	
São José da Bela Vista	2	0	4	2	2	2	6	2	2	2	2	2	2	30	
São Simão	0	2	2	2	2	1	2	7	2	2	2	2	2	28	
Serra Azul	2	2	2	2	2	2	2	2	2	2	2	2	7	31	
Serrana	2	2	2	2	2	2	2	2	2	2	2	2	0	24	
Sertãozinho	4	6	6	6	6	6	6	6	6	6	10	6	4	78	
Severínia	0	7	6	16	16	7	7	20	3	3	6	7	6	104	
Tabatinga	2	2	2	2	2	2	2	6	2	0	0	2	6	30	
Taiacu	4	5	6	7	7	7	3	9	7	3	4	5	4	71	
Taiuva	4	5	4	5	7	7	4	7	7	3	5	5	4	67	
Taquaral	4	5	4	5	6	2	5	8	5	3	4	5	9	65	
Taquaritinga	0	3	3	3	3	3	3	3	3	3	3	3	0	33	
Terra Roxa	3	3	3	4	6	3	6	6	6	3	7	3	3	56	
Trabiju	0	8	4	4	4	4	4	4	4	2	4	4	4	50	
Viradouro	2	2	2	2	3	3	0	5	3	3	2	0	0	27	
Vista Alegre do Alto	5	5	4	5	0	9	6	6	3	3	3	5	5	59	
TOTAL	263	402	397	407	401	399	393	462	416	237	384	354	338	4853	

Table SM 02 – Raw data matrix, 89 cities (*Microsoft Excel*® software, version 2019).

City	Lithium mg L ⁻¹ (mean)	Sodium mg L ⁻¹ (mean)	Ammon mg L ⁻¹ (mean)	Potass mg L ⁻¹ (mean)	Calcium mg L ⁻¹ (mean)	Magnes mg L ⁻¹ (mean)	Fluoride mg L ⁻¹ (mean)	Chlorite mg L ⁻¹ (mean)	Bromate mg L ⁻¹ (mean)	Chloride mg L ⁻¹ (mean)	Nitrate mg L ⁻¹ (mean)	AMPA mg L ⁻¹ (mean)	Sulfate mg L ⁻¹ (mean)	Phosph mg L ⁻¹ (mean)	Glyphos mg L ⁻¹ (mean)	Temp °C (mean)	FRC mg L ⁻¹ (mean)	pH (mean)	Color Pt-Co (mean)	Turb NTU (mean)	Cond µS cm ⁻¹ (mean)	%MB+	NINH	GDPpc R\$	MHDI	HOSP
Altair	0.00068	4.119	0.00026	4.881	21.524	3.728	0.639	0.00036	0	5.105	3.579	0	0.01105	0.17719	0.00096	25.2	0.3	7.02	0.58	0.09	175.1	9	3815	25842.48	0.687	0.000
Altinópolis	0.00016	1.765	0.00077	1.564	1.798	0.864	0.674	0	0	2.278	1.262	0	0.02378	0.01374	0	23.7	0.7	6.41	1.42	0.1	34	4.2	15607	30792.08	0.73	0.320
Am Bras	0.00108	3.803	0.002	4.01	10.65	3.221	0.472	0	0	1.826	0.756	0	0.306	0.125	0	26.6	0.29	8.05	1.75	0.04	107.9	34.4	34478	24008.7	0.751	0.145
Aramina	0.00016	6.002	0.00005	1.676	5.331	2.343	0.197	0	0	1.041	1.439	0	0.132	0.057	0	27	0.32	6.51	0.78	0.04	78.2	3.7	5152	22669.33	0.74	0.388
Araraquara	0.00049	2.636	0.00005	3.432	7.743	1.43	0.678	0	0.00006	2.872	0.232	0	0.3	0.188	0.0014	24.4	0.84	7.01	1.47	0.13	73.9	6.5	208662	40253.93	0.815	0.206
Barretos	0.00197	27.997	0	1.735	7.412	0.947	0.63	0	0.0005	7.157	0.349	0	7.913	0.11	0.00124	27.6	0.76	8.21	1.15	0.17	172.7	0.6	112101	40046.22	0.789	0.143
Barrinha	0.00104	5.576	0	2.31	22.101	2.419	0.173	0.00269	0	1.415	1.04	0	0.338	0.00285	0	27.6	0.33	7.34	0.4	0.06	158.4	4.6	28496	15960.29	0.725	0.035
Batatais	0.00029	3.585	0	4.749	4.614	1.044	0.487	0	0.00195	1.221	0.237	0	0.908	0.048	0	26.2	0.58	6.78	1.53	0.09	62.7	0.7	56476	25636.34	0.761	0.992
Bebedouro	0.0021	15.019	0.007	3.725	14.459	3.54	0.622	0	0.00002	4.853	1.258	0	3.471	0.113	0.00129	26.1	0.82	7.3	1.36	0.11	176.9	1.4	75035	43191.17	0.78	0.080
Boa Esp Sul	0.00081	1.761	0.00009	2.16	12.866	1.286	0.041	0	0	0.303	0.562	0	0.02	0.074	0	24.5	0.28	6.84	0.71	0.06	85.8	6.5	13645	20877.23	0.681	0.293
Borborema	0.00689	62.564	0.00293	3.384	4.624	1.4	0.533	0.00025	0.00042	5.478	1.459	0	1.933	0.078	0	26	0.69	9.52	2.69	0.32	318	19.7	14529	23374.91	0.73	0.344
Brodowski	0.00041	1.813	0.00055	7.87	5.02	1.37	0.393	0	0.00327	0.555	0.24	0	0.128	0.214	0	28.8	0.53	7.51	1.1	0.22	67.7	27.6	21107	27203.14	0.755	0.758
Buritizal	0.00097	7.029	0	3.569	17.202	3.068	0.706	0.0001	0	0.924	0.012	0	0.082	0.035	0	26.5	1.24	7.03	0.62	0.08	147.6	3.8	4053	40019.23	0.735	0.247
Cajobi	0.0032	27.749	0	2.272	16.248	4.128	0.619	0.0002	0	4.009	2.311	0	2.71	0.039	0.0029	26.5	1.02	8.67	1.21	0.07	236.3	3.2	9768	14873.72	0.734	3.993
Cajuru	0	8.485	0	0.663	2.104	0.858	0.658	0	0	8.748	0.151	0	0.573	0.065	0.0027	24.1	1.19	7.65	5.73	0.48	60.6	1	23371	22061.52	0.713	1.712
Cand Rodr	0.0055	21.235	0	0.863	16.943	8.478	0.637	0	0	3.667	1.305	0	0.703	0	0	20.3	1	6.89	1.81	0.06	239.7	28.6	2668	35917.03	0.789	0.000
Cass Coq	0	6.93	0	1.386	2.474	1.143	0.618	0	0	8.584	0.445	0	1.296	0.003	0.0034	23.1	0.75	6.83	3.96	0.21	62.9	2.2	2634	58581.94	0.734	1.139
Colina	0.00122	5.241	0	4.954	6.294	2.298	0.581	0	0	4.452	0.588	0	0.026	0.184	0	27	0.89	6.34	1.26	0.17	90.8	0	17371	60218.14	0.757	0.288
Colômbia	0.00018	15.288	0	2.581	10.431	3.129	0.692	0.0004	0	11.988	1.812	0	1.888	0.045	0.00157	24.7	1	8.35	1.68	0.06	159.6	1.7	5994	53207.43	0.71	0.167
Cravinhos	0.00019	1.611	0.00053	3.676	2.671	1.3	0.322	0.00018	0	0.483	0.081	0	0.019	0.044	0	27.2	0.22	6.81	1.24	0.17	42.4	21.2	31691	34165.63	0.756	0.252
Crist Pta	0.00003	10.983	0	2.42	6.003	1.172	0.541	0	0	11.119	0.227	0	0.236	0.012	0	22.3	1.34	7.27	0.91	0.06	102.4	12.5	7588	22617.1	0.734	0.132
Descalvado	0.00219	13.705	0	1.345	3.743	0.648	0.634	0	0	2.007	0.809	0	1.086	0.038	0.00213	24.7	0.81	7.26	1.69	0.13	88.9	3.4	31056	47327.8	0.76	0.869
Dobrada	0.00232	11.969	0.00382	3.93	19.655	3.926	0.376	0.0009	0.0036	2.849	2.716	0	0.222	0.057	0	28.8	0.39	6.68	2.54	0.22	192.8	21.1	7939	13045.55	0.718	0.378
Dourado	0.00167	3.577	0	2.2	27.101	4.433	0.587	0	0	1.698	0.801	0	0.173	0.07	0.00125	27.3	0.583	7.57	1.185	0.093	188.4	14.8	8609	70723.95	0.738	0.232
Dumont	0.00159	3.475	0.00022	3.564	19.225	3.315	0.605	0	0	0.385	0.122	0	0.047	0.127	0	30	0.72	7.12	1.25	0.14	146.1	3.6	8143	23587.84	0.744	0.368
Gavião Peix	0.00062	1.909	0	7.049	6.378	1.193	0.413	0.00178	0	0.633	0.048	0	0.031	0.432	0.00203	24.9	0.4	6.65	0.43	0.06	70.5	17.9	4419	186287.7	0.719	0.000
Guairá	0.00186	18.815	0.00009	0.586	4.807	1.627	0.591	0	0	7.976	0.107	0	1.457	0.049	0.0016	28.3	0.74	7.03	1.67	0.1	125.3	0.9	37404	80169.84	0.753	1.818
Guará	0.0047	77.46	0.00005	0.731	4.849	0.453	0.57	0	0	1.117	0.374	0	2.232	0.025	0	27.4	0.37	8.65	0.96	0.07	345.5	21.7	19858	20804.61	0.718	0.453
Guaraci	0	4.916	0.0001	2.535	3.572	1.577	0.87	0.00039	0	9.209	0.107	0	0.646	0	0	NM	1.05	6.71	12.4	1.56	67.1	30.8	9976	20683.17	0.737	0.100
Guariba	0.00265	8.836	0	2.502	17.979	2.075	0.576	0	0	1.084	0.131	0	0.214	0.009	0	23.4	0.94	7.54	1.26	0.18	147.9	7.4	35486	22657.16	0.719	0.366
Guataporá	0.0007	1.474	0.00056	3.348	4.037	1.492	0.076	0	0	0.273	0.164	0	0.02	0.172	0.0022	24	0.34	6.8	0.82	0.1	48.6	50	6966	28000.56	0.743	0.287
Ibaté	0.00052	1.378	0	3.534	2.94	1.387	0.568	0	0	1.61	0.702	0	0.073	0.107	0.002	24.8	0.89	6.52	1.06	0.15	44.9	12.9	30734	24454.14	0.703	0.488
Ibitinga	0.01517	100.29	0.00358	0.752	2.43	0.513	0.686	0.0007	0.00001	9.465	0.355	0	22.976	0.016	0.003	28.1	0.41	9.69	1.02	0.1	453.5	23.4	53158	25630.47	0.747	0.038
Igarapava	0.00223	5.65	0	2.931	16.144	5.63	0.66	0.00137	0	3.815	2.217	0	0.217	0.058	0	29.3	0.73	6.14	0.72	0.09	160.4	0.9	27952	39002.62	0.768	0.680
Ipuã	0	7.714	0	0.593	7.177	1.836	0.483	0	0.00072	3.973	0.787	0	0.559	0.033	0	26.4	0.42	8.02	2.03	0.24	88	10.3	14148	22139.12	0.749	0.071
Itápolis	0.00963	41.947	0.00047	1.375	6.299	1.649	0.31	0	0	2.74	1.477	0	3.223	0.058	0	26.4	0.56	8.61	1.85	0.17	219.9	2.5	40051	30504.92	0.744	0.999
Itirapuã	0.00141	19.733	0	2.343	13.773	3.376	0.662	0	0	1.541	0.009	0	3.607	0	0	24	1	7.8	1.11	0.03	181.6	5.3	5914	15275.66	0.707	0.000
Ituverava	0	3.165	0.00015	1.823	8.059	1.615	0.661	0.0001	0	6.757	0.66	0	5.633	0.01	0	25.4	0.74	6.96	4.94	0.52	80.8	12.5	38695	36651.33	0.765	0.853
Jaborandi	0.00128	19.303	0.00011	1.209	8.038	3.065	0.658	0	0	2.887	0.441	0	7.706	0.112	0	27.2	0.64	7.23	0.92	0.08	151	15.4	6592	19946.28	0.711	0.303
Jaboticabal	0.00019	7.157	0.00022	3.127	16.39	2.603	0.545	0.00024	0.00027	16.269	0.774	0	0.88	0.024	0.00217	26.7	0.94	7.25	2.15	0.16	155.2	3.2	71662	37818.06	0.778	0.223
Jardimópolis	0.00099	2.474	0	8.578	6.593	1.57	0.451	0	0	0.139	0.033	0	0.024	0.345	0	29.5	0.51	7.02	1.12	0.08	81.2	3	37661	25060.21	0.735	0.186
Jeriquara	0.00116	3.774	0	2.374	11.753	2.914	0.642	0	0	0.907	0.22	0	0.04	0.126	0	23.7	1.01	7.2	0.79	0.05	104	16.7	3160	26005.63	0.703	0.633
Luiz Antônio	0.00003	1.184	0	1.356	3.634	0.99	0.123	0	0	0.664	0.959	0	0.013	0.019	0.00062	26.3	0.48	5.74	0.63	0.09	38.8	0	11286	103433.6	0.731	0.089
Matão	0.0021	7.832	0	4.113	31.403	4.112	0.664	0.00034	0	1.421	0.828	0	0.258	0.046	0.00916	25.9	0.46	7.3	0.63	0.05	228.1	2.4	76786	50228.39	0.773	0.651
Miguelópolis	0.00111	22.29	0	0.695	12.194	3.627	0.794	0	0	3.64	2.049	0	1.036	0.086	0.0032	25.1	1	7.02	1.1	0.03	184.8	0	20451	45954.52	0.741	2.934
Monte Alto	0.00803	17.441	0	2.092	18.191	1.469	0.692	0	0	1.096	0.023	0	0.9803	0.0099	0	29.4	0.5	7.12	0.58	0.06	177.6	3.8	46642	35901.3	0.768	0.622
Monte Az Pta	0.00291	10.715	0.00009	2.747</																						

Table SM 02 (cont.) – Raw data matrix, 89 cities (Microsoft Excel® software, version 2019).

City	Lithium (mean)	Sodium (mean)	Ammon (mean)	Potass (mean)	Calcium (mean)	Magnes (mean)	Fluoride (mean)	Chlorite (mean)	Bromate (mean)	Chloride (mean)	Nitrate (mean)	AMPA (mean)	Sulfate (mean)	Phosph (mean)	Glyphos (mean)	Temp (mean)	FRC (mean)	pH (mean)	Color (mean)	Turb (mean)	Cond (mean)	%MB+	ninh	GDPpc	MHDI	hosp
Pitangueiras	0.01371	40.456	0	1.091	6.226	0.606	0.626	0.00002	0	6.945	0.076	0	1.638	0.007	0	30.7	0.92	8.42	1.12	0.07	213.5	4.1	35307	27053.73	0.723	0.736
Pontal	0.00172	6.81	0	2.983	25.102	2.55	0.834	0	0	4.21	1.263	0	0.154	0.007	0	25.6	0.56	6.08	0.61	0.06	183.5	15.2	40244	23772.76	0.725	0.298
Porto Ferr	0.00057	14.047	0.0003	3.341	4.894	1.632	0.706	0	0.00008	17.408	1.357	0	3.63	0.004	0.00494	27.2	0.82	6.68	3.1	0.31	124	3.5	51400	36767.59	0.751	0.447
Pradópolis	0.00023	1.786	0.00055	2.649	3.309	1.226	0.401	0	0.00289	0.99	0.026	0	0.014	0.23	0	26.3	0.76	6.83	0.76	0.16	42.5	3.4	17377	40977.09	0.733	0.115
Restinga	0.00007	3.625	0	3.49	6.75	1.742	0.664	0	0	3.642	0.205	0	0.386	0.066	0	19.9	1.46	7.53	0.83	0.12	76.7	3.1	6587	22126.48	0.705	0.000
Ribeirão Bonito	0.00021	1.349	0.00106	2.176	2.894	1.214	0.037	0	0	1.306	1.533	0	0.12	0.074	0.00195	24	0.7	6.88	3.89	0.6	40.8	74.1	12135	19500.82	0.712	0.412
Ribeirão Corrente	0.00061	7.138	0	4.453	7.741	2.508	0.663	0	0	1.357	0.103	0	0.035	0.131	0.00238	19	0.5	6.5	0.73	0.07	101.7	10	4273	23548.05	0.711	0.234
Ribeirão Preto	0.00046	2.923	0.00009	3.775	6.148	1.602	0.605	0.00001	0.0039	2.571	0.681	0	0.345	0.16	0.00054	26	1.35	6.39	1.17	0.17	71	4.1	604682	49425.29	0.8	0.241
Rifaina	0.0025	5.429	0.00065	3.673	18.032	2.285	0.63	0	0	2.371	1.188	0	0.084	0.214	0.00176	15	NM	7	1.57	0.15	142.7	26.7	3436	33254.17	0.74	0.291
Rincão	0.00104	1.718	0.00014	3.415	10.438	2.421	0.099	0	0	0.746	0.437	0	0.018	0.167	0	8	NM	7.3	0.89	0.09	89.1	18.5	10414	18176.48	0.734	0.000
Sales Oliv	0.00154	5.276	0.00015	3.321	16.813	2.86	0.289	0.00088	0.00085	0.775	0.152	0	0.081	0.084	0.00059	26.1	0.62	7.51	0.75	0.05	135.8	12.5	10568	29378.39	0.772	0.379
Santa Cruz Esp	0.003	26.302	0	0.609	8.296	1.969	0.692	0	0	1.749	0.035	0	0.132	0	0	26	0.42	9.3	0.67	0.09	164.7	0	1953	24309.59	0.743	3.072
Santa Ernestina	0.0023	5.883	0	3.715	20.522	4.183	0.649	0	0	1.774	2.012	0	0.233	0.027	0	26.3	0.71	7.3	0.61	0.03	172	0	5568	16537.75	0.738	0.000
Santa Lúcia	0.00024	2.647	0	2.303	11.086	2.68	0.392	0	0	0.248	0.071	0	0.088	0.09	0	25.4	0.31	6.99	2.03	0.13	93.2	3.3	8248	13080.61	0.737	0.242
Santa Ri Pass Qua	0	8.846	0	1.373	12.353	2.373	0.571	0.00507	0.00044	19.608	1.054	0	1.248	0.255	0.0139	23.8	0.78	6.78	2.39	0.28	138.4	11.7	26478	24132.89	0.775	0.718
Santa Ro Viterbo	0	10.663	0	2.005	2.335	1.252	0.623	0.0001	0	12.661	0.795	0	4.805	0	0.00252	24.6	1.57	7.66	3.28	0.23	84.6	2.1	23862	26438.67	0.77	0.503
Santo Ant Alegria	0.00083	3.688	0.0005	2.917	13.6	2.997	0.133	0	0	0.328	0.298	0	0.123	0.041	0	18.6	0.49	6.53	1.04	0.04	114	41.7	6304	18953.27	0.702	1.269
São Carlos	0.00059	4.246	0.00029	2.833	4.658	1.237	0.658	0	0.00021	3.489	0.732	0	2.523	0.067	0.00157	23.9	1.12	6.87	3	0.37	65	3.6	221950	44796.83	0.805	0.167
São Joaquim Barra	0.00048	7.91	0.00291	1.632	8.08	2.072	0.49	0	0	2.508	0.361	0	0.992	0.022	0.00113	21.2	0.88	7.07	2.72	0.48	96.8	8	46512	33011.12	0.762	0.000
São Jose B Vista	0.00079	26.054	0.00033	2.024	5.684	1.005	1.082	0	0.00006	3.007	0.195	0	0.623	0.033	0	23.4	0.65	8.82	2.53	0.34	152.2	16.7	8406	18219.25	0.693	0.119
São Simão	0	2.196	0.00001	1.68	3.268	1.361	0.566	0	0	1.521	1.489	0	0.409	0.006	0	27.5	0.65	6.35	0.39	0.06	46.9	0	14346	29049.13	0.766	1.324
Serra Azul	0.00025	8.282	0	1.452	2.13	0.675	0.67	0	0	1.497	0.989	0	0.027	0.029	0	20.8	0.51	6	0.9	0.08	57.7	9.7	11256	10758.97	0.686	0.089
Serrana	0.00012	3.105	0	2.369	5.835	1.874	0.162	0	0	2.022	1.429	0	0.245	0.091	0.00105	23.7	0.75	5.83	0.83	0.06	69.6	0	38878	20663.93	0.729	0.154
Sertãozinho	0.00228	10.677	0	3.367	23.936	1.638	0.556	0	0	1.569	0.069	0	2.2	0.017	0.00069	25.6	0.67	7.44	0.88	0.04	182.8	6.4	110074	44163.83	0.761	0.200
Severínia	0.0022	14.454	0.00054	2.383	27.657	7.593	0.441	0	0	8.178	5.517	0	0.95	0.013	0.0099	NM	0.31	7.53	1.1	0.1	271.8	8.7	15501	13372.83	0.715	0.258
Tabatinga	0.00283	8.675	0.00021	3.209	22.563	2.492	0.517	0	0	0.551	0.242	0	0.506	0.017	0	25.6	0.36	7	1.17	0.05	174.6	10	14686	15488.05	0.704	2.111
Taiacu	0.0021	33.067	0	2.423	12.033	3.301	0.474	0.00004	0	3.206	2.859	0	1.677	0.059	0.00052	24.8	0.54	8	0.9	0.05	231.3	5.6	5894	15473.51	0.71	0.848
Taiuva	0.00301	8.778	0	2.345	19.375	6.319	0.455	0	0	2.454	1.341	0	0.217	0.002	0	21.6	0.54	6.85	3.1	0.25	188.3	3	5447	20486.83	0.76	0.000
Taquaral	0.0023	5.735	0.00005	2.893	22.941	6.126	0.5	0	0	3.111	2.448	0	0.056	0.006	0	24.3	0.53	7.5	1.32	0.15	196.9	3.1	2726	13710.81	0.759	0.000
Taquaritinga	0.00454	13.273	0	2.806	19.079	4.264	0.622	0	0	2.825	0.687	0	2.824	0.016	0	29.8	0.37	7.69	1.55	0.49	191.3	3	53988	27561.71	0.748	0.019
Terra Roxa	0.00118	18.453	0	1.272	20.97	5.517	0.672	0	0	7.637	3.876	0	1.125	0.054	0.0111	24.3	0.62	7	1.52	0.1	232.4	0	8505	15136.01	0.749	4.115
Trabiju	0.00114	4.172	0	3.418	7.49	3.126	0.798	0	0	4.102	4.388	0	0.42	0.032	0.00262	25	0.21	6.03	1.28	0.15	102.2	14	1544	23765.75	0.722	0.648
Viradouro	0	4.814	0.00034	2.082	3.741	1.328	0.706	0	0.0009	5.904	0.093	0	0.343	0	0	25.3	0.65	7	5.11	0.56	60.3	3.7	17297	18419.26	0.739	0.347
Vista Aleg Alto	0.00389	12.986	0.00009	2.575	24.475	7.714	0.463	0.00007	0	7.359	3.25	0	0.249	0.021	0.00058	23.1	0.76	7.32	0.69	0.06	249.1	1.7	6886	40055.36	0.744	0.290

Table SM 03 – Comparison of nitrate concentrations obtained in two different periods.

	Previous study (2015-2016; n = 4.347 samples)	Current study (2019-2020; n = 4.853 samples)
Samples with the presence of nitrate	3,119 (71.8%)	3,920 (80.8%)
Samples with concentrations greater than 10 mgN-NO ₃ L ⁻¹	17 (0.4%)	26 (0.5%)
Samples with concentrations between 5 and 10 mgN-NO ₃ L ⁻¹	122 (2.8%)	174 (3.6%)

Table SM 04 – Correlation matrix, 89 cites, 26 variables (The Unscrambler® software, version 10.3).

	Li ⁺	Na ⁺	NH ₄ ⁺	K ⁺	Ca ²⁺	Mg ²⁺	F ⁻	ClO ₂	BrO ₃ ⁻	Cl ⁻	NO ₃ ⁻	AMPA	SO ₄ ²⁻	PO ₄ ³⁻	Glyph	Temp	FRC	pH	Color	Turb	Cond	%MB+	NINH	GDPpc	MHDI	HOSP
Li ⁺	1.000	0.759	0.239	-0.235	0.132	0.073	0.100	-0.023	-0.110	0.059	0.036		0.465	-0.204	-0.063	0.242	-0.107	0.532	-0.148	-0.144	0.716	0.020	-0.010	-0.089	0.039	0.070
Na ⁺	0.759	1.000	0.276	-0.369	-0.091	-0.088	0.222	0.025	-0.110	0.208	0.050		0.643	-0.198	0.028	0.204	-0.040	0.685	-0.053	-0.080	0.788	0.021	-0.033	-0.110	-0.061	0.130
NH ₄ ⁺	0.239	0.276	1.000	0.054	-0.027	-0.007	-0.077	0.008	0.171	0.034	0.066		0.270	0.025	-0.035	0.056	-0.058	0.198	0.074	0.104	0.237	0.208	0.035	-0.059	0.108	-0.129
K ⁺	-0.235	-0.369	0.054	1.000	0.064	-0.021	-0.098	0.017	0.263	-0.258	-0.084		-0.237	0.563	-0.071	0.044	-0.099	-0.251	-0.157	-0.069	-0.239	0.083	0.081	0.153	0.067	-0.227
Ca ²⁺	0.132	-0.091	-0.027	0.064	1.000	0.742	0.001	0.127	-0.077	-0.045	0.422		-0.092	-0.155	0.256	0.039	-0.164	0.103	-0.238	-0.202	0.524	-0.127	-0.073	-0.088	0.037	0.175
Mg ²⁺	0.073	-0.088	-0.007	-0.021	0.742	1.000	0.009	0.044	-0.098	0.064	0.647		-0.152	-0.147	0.220	-0.064	-0.105	0.018	-0.139	-0.158	0.451	-0.062	-0.148	-0.130	0.094	0.222
F ⁻	0.100	0.222	-0.077	-0.098	0.001	0.009	1.000	-0.069	-0.105	0.308	0.016		0.123	-0.150	0.089	0.120	0.280	0.117	0.190	0.096	0.201	-0.298	0.092	0.005	0.057	0.075
ClO ₂	-0.023	0.025	0.008	0.017	0.127	0.044	-0.069	1.000	0.045	0.350	0.071		0.086	0.318	0.382	0.079	-0.072	-0.036	0.003	0.032	0.111	0.022	-0.033	0.125	0.111	-0.027
BrO ₃ ⁻	-0.110	-0.110	0.171	0.263	-0.077	-0.098	-0.105	0.045	1.000	-0.081	-0.060		-0.069	0.207	0.006	0.189	0.042	-0.063	0.035	0.089	-0.134	0.027	0.440	0.001	0.168	-0.071
Cl ⁻	0.059	0.208	0.034	-0.258	-0.045	0.064	0.308	0.350	-0.081	1.000	0.227		0.279	-0.138	0.447	0.077	0.334	0.154	0.364	0.255	0.206	-0.161	0.022	0.008	0.171	0.112
NO ₃ ⁻	0.036	0.050	0.066	-0.084	0.422	0.647	0.016	0.071	-0.060	0.227	1.000		-0.064	-0.125	0.333	0.003	-0.207	-0.037	-0.120	-0.134	0.374	-0.063	-0.103	-0.172	-0.082	0.284
AMPA												1.000														
SO ₄ ²⁻	0.465	0.643	0.270	-0.237	-0.092	-0.152	0.123	0.086	-0.069	0.279	-0.064		1.000	-0.112	0.066	0.185	0.147	0.435	0.051	0.082	0.495	-0.035	0.075	-0.012	0.125	0.014
PO ₄ ³⁻	-0.204	-0.198	0.025	0.563	-0.155	-0.147	-0.150	0.318	0.207	-0.138	-0.125		-0.112	1.000	0.067	-0.089	-0.095	-0.189	-0.197	-0.134	-0.240	0.163	0.135	0.355	0.048	-0.157
Glyph	-0.063	0.028	-0.035	-0.071	0.256	0.220	0.089	0.382	0.006	0.447	0.333		0.066	0.067	1.000	-0.018	-0.023	0.046	0.081	0.049	0.202	-0.081	0.000	0.098	0.125	0.271
Temp	0.242	0.204	0.056	0.044	0.039	-0.064	0.120	0.079	0.189	0.077	0.003		0.185	-0.089	-0.018	1.000	-0.242	0.170	-0.058	0.017	0.193	-0.246	0.095	0.110	0.157	0.114
FRC	-0.107	-0.040	-0.058	-0.099	-0.164	-0.105	0.280	-0.072	0.042	0.334	-0.207		0.147	-0.095	-0.023	-0.242	1.000	0.055	0.263	0.240	-0.121	-0.210	0.278	0.047	0.247	0.050
pH	0.532	0.685	0.198	-0.251	0.103	0.018	0.117	-0.036	-0.063	0.154	-0.037		0.435	-0.189	0.046	0.170	0.055	1.000	0.016	0.028	0.627	-0.007	-0.090	-0.133	-0.026	0.218
Color	-0.148	-0.053	0.074	-0.157	-0.238	-0.139	0.190	0.003	0.035	0.364	-0.120		0.051	-0.197	0.081	-0.058	0.263	0.016	1.000	0.913	-0.175	0.188	-0.008	-0.058	0.082	-0.032
Turb	-0.144	-0.080	0.104	-0.069	-0.202	-0.158	0.096	0.032	0.089	0.255	-0.134		0.082	-0.134	0.049	0.017	0.240	0.028	0.913	1.000	-0.182	0.223	0.040	-0.041	0.112	-0.098
Cond	0.716	0.788	0.237	-0.239	0.524	0.451	0.201	0.111	-0.134	0.206	0.374		0.495	-0.240	0.202	0.193	-0.121	0.627	-0.175	-0.182	1.000	-0.054	-0.081	-0.150	-0.005	0.218
%MB+	0.020	0.021	0.208	0.083	-0.127	-0.062	-0.298	0.022	0.027	-0.161	-0.063		-0.035	0.163	-0.081	-0.246	-0.210	-0.007	0.188	0.223	-0.054	1.000	-0.126	-0.117	-0.191	-0.149
NINH	-0.010	-0.033	0.035	0.081	-0.073	-0.148	0.092	-0.033	0.440	0.022	-0.103		0.075	0.135	0.000	0.095	0.278	-0.090	-0.008	0.040	-0.081	-0.126	1.000	0.111	0.492	-0.088
GDPpc	-0.089	-0.110	-0.059	0.153	-0.088	-0.130	0.005	0.125	0.001	0.008	-0.172		-0.012	0.355	0.098	0.110	0.047	-0.133	-0.058	-0.041	-0.150	-0.117	0.111	1.000	0.162	-0.089
MHDI	0.039	-0.061	0.108	0.067	0.037	0.094	0.057	0.111	0.168	0.171	-0.082		0.125	0.048	0.125	0.157	0.247	-0.026	0.082	0.112	-0.005	-0.191	0.492	0.162	1.000	0.011
HOSP	0.070	0.130	-0.129	-0.227	0.175	0.222	0.075	-0.027	-0.071	0.112	0.284		0.014	-0.157	0.271	0.114	0.050	0.218	-0.032	-0.098	0.218	-0.149	-0.088	-0.089	0.011	1.000

Table SM 05 – Groundwater raw data matrix, 51 cities, 26 variables (*Microsoft Excel®* software, version 2019).

City	Lithium mg L ⁻¹ (mean)	Sodium mg L ⁻¹ (mean)	Ammon mg L ⁻¹ (mean)	Potass mg L ⁻¹ (mean)	Calcium mg L ⁻¹ (mean)	Magnes mg L ⁻¹ (mean)	Fluoride mg L ⁻¹ (mean)	Chlorite mg L ⁻¹ (mean)	Bromate mg L ⁻¹ (mean)	Chloride mg L ⁻¹ (mean)	Nitrate mg L ⁻¹ (mean)	AMPA mg L ⁻¹ (mean)	Sulfate mg L ⁻¹ (mean)	Phosph mg L ⁻¹ (mean)	Glyphos mg L ⁻¹ (mean)	Temp °C (mean)	FRC mg L ⁻¹ (mean)	pH (mean)	Color Pt-Co (mean)	Turb NTU (mean)	Cond µS cm ⁻¹ (mean)	%MB+	NINH	GDPpc R\$	MHDI	HOSP
Altair	0.00068	4.119	0.00026	4.881	21.524	3.728	0.639	0.00036	0	5.105	3.579	0	0.01105	0.17719	0.00096	25.2	0.3	7.02	0.58	0.09	175.1	9	3815	25842.48	0.687	0
Am Bras	0.00108	3.803	0.002	4.01	10.65	3.221	0.472	0	0	1.826	0.756	0	0.306	0.125	0	26.6	0.29	8.05	1.75	0.04	107.9	34.4	34478	24008.7	0.751	0.145
Aramina	0.00016	6.002	0.00005	1.676	5.331	2.343	0.197	0	0	1.041	1.439	0	0.132	0.057	0	27	0.32	6.51	0.78	0.04	78.2	3.7	5152	22669.33	0.74	0.388
Barrinha	0.00104	5.576	0	2.31	22.101	2.419	0.173	0.00269	0	1.415	1.04	0	0.338	0.00285	0	27.6	0.33	7.34	0.4	0.06	158.4	4.6	28496	15960.29	0.725	0.035
Boa Esp Sul	0.00081	1.761	0.00009	2.16	12.866	1.286	0.041	0	0	0.303	0.562	0	0.02	0.074	0	24.5	0.28	6.84	0.71	0.06	85.8	6.5	13645	20877.23	0.681	0.293
Brodowski	0.00041	1.813	0.00055	7.87	5.02	1.37	0.393	0	0.00327	0.555	0.24	0	0.128	0.214	0	28.8	0.53	7.51	1.1	0.22	67.7	27.6	21107	27203.14	0.755	0.758
Buritizal	0.00097	7.029	0	3.569	17.202	3.068	0.706	0.0001	0	0.924	0.012	0	0.082	0.035	0	26.5	1.24	7.03	0.62	0.08	147.6	3.8	4053	40019.23	0.735	0.247
Cajobi	0.0032	27.749	0	2.272	16.248	4.128	0.619	0.0002	0	4.009	2.311	0	2.71	0.039	0.0029	26.5	1.02	8.67	1.21	0.07	236.3	3.2	9768	14873.72	0.734	3.993
Cand Rodr	0.0055	21.235	0	0.863	16.943	8.478	0.637	0	0	3.667	1.305	0	0.703	0	0	20.3	1	6.89	1.81	0.06	239.7	28.6	2668	35917.03	0.789	0
Colina	0.00122	5.241	0	4.954	6.294	2.298	0.581	0	0	4.452	0.588	0	0.026	0.184	0	27	0.89	6.34	1.26	0.17	90.8	0	17371	60218.14	0.757	0.288
Dobrada	0.00232	11.969	0.00382	3.93	19.655	3.926	0.376	0.0009	0.0036	2.849	2.716	0	0.222	0.057	0	28.8	0.39	6.68	2.54	0.22	192.8	21.1	7939	13045.55	0.718	0.378
Dourado	0.00167	3.577	0	2.2	27.101	4.433	0.587	0	0	1.698	0.801	0	0.173	0.07	0.00125	27.3	0.583	7.57	1.185	0.093	188.4	14.8	8609	70723.95	0.738	0.232
Dumont	0.00159	3.475	0.00022	3.564	19.225	3.315	0.605	0	0	0.385	0.122	0	0.047	0.127	0	30	0.72	7.12	1.25	0.14	146.1	3.6	8143	20877.23	0.734	0.368
Gavião Peix	0.00062	1.909	0	7.049	6.378	1.193	0.413	0.00178	0	0.633	0.048	0	0.031	0.432	0.00203	24.9	0.4	6.65	0.43	0.06	70.5	17.9	4419	186287.7	0.719	0
Guará	0.0047	77.46	0.00005	0.731	4.849	0.453	0.57	0	0	1.117	0.374	0	2.232	0.025	0	27.4	0.37	8.65	0.96	0.07	345.5	21.7	19858	20804.61	0.718	0.453
Guariba	0.00265	8.836	0	2.502	17.979	2.075	0.576	0	0	1.084	0.131	0	0.214	0.009	0	23.4	0.94	7.54	1.26	0.18	147.9	7.4	35486	22657.16	0.719	0.366
Guataparã	0.0007	1.474	0.00056	3.348	4.037	1.492	0.076	0	0	0.273	0.164	0	0.02	0.172	0.0022	24	0.34	6.8	0.82	0.1	48.6	50	6966	28000.56	0.743	0.287
Ibaté	0.00052	1.378	0	3.534	2.94	1.387	0.568	0	0	1.61	0.702	0	0.073	0.107	0.002	24.8	0.89	6.52	1.06	0.15	44.9	12.9	30734	24454.14	0.703	0.488
Igarapava	0.00223	5.65	0	2.931	16.144	5.63	0.66	0.00137	0	3.815	2.217	0	0.217	0.058	0	29.3	0.73	6.14	0.72	0.09	160.4	0.9	27952	39002.62	0.768	0.68
Itirapuã	0.00141	19.733	0	2.343	13.773	3.376	0.662	0	0	1.541	0.009	0	3.607	0	0	24	1	7.8	1.11	0.03	181.6	5.3	5914	15275.66	0.707	0
Jaborandi	0.00128	19.303	0.00011	1.209	8.038	3.065	0.658	0	0	2.887	0.441	0	7.706	0.112	0	27.2	0.64	7.23	0.92	0.08	151	15.4	6592	19946.28	0.711	0.303
Jeriquara	0.00116	3.774	0	2.374	11.753	2.914	0.642	0	0	0.907	0.22	0	0.04	0.126	0	23.7	1.01	7.2	0.79	0.05	104	16.7	3160	26005.63	0.703	0.633
Luiz Antônio	0.00003	1.184	0	1.356	3.634	0.99	0.123	0	0	0.664	0.959	0	0.013	0.019	0.00062	26.3	0.48	5.74	0.63	0.09	38.8	0	11286	103433.6	0.731	0.089
Matão	0.0021	7.832	0	4.113	31.403	4.112	0.664	0.00034	0	1.421	0.828	0	0.258	0.046	0.00916	25.9	0.46	7.3	0.63	0.05	228.1	2.4	76786	50228.39	0.773	0.651
Miguelópolis	0.00111	22.29	0	0.695	12.194	3.627	0.794	0	0	3.64	2.049	0	1.036	0.086	0.0032	25.1	1	7.02	1.1	0.03	184.8	0	20451	45954.52	0.741	2.934
Monte Alto	0.00803	17.441	0	2.092	18.191	1.469	0.692	0	0	1.096	0.023	0	0.9803	0.0099	0	29.4	0.5	7.12	0.58	0.06	177.6	3.8	46642	35901.3	0.768	0.622
Monte Az Pta	0.00291	10.715	0.00009	2.747	30.018	7.883	0.396	0.00034	0	6.991	3.549	0	0.517	0.009	0.00373	27.1	0.6	8.58	0.78	0.07	263.2	8.2	18931	28033.28	0.753	4.754
Motuca	0.00085	1.412	0	3.273	3.444	1.212	0.253	0	0	0.065	0.003	0	0.025	0.046	0	26.6	0.48	7.3	1	0.07	42.7	10.3	4290	17286.33	0.741	0
Nova Europa	0.0004	1.382	0	8.292	3.049	0.844	0.704	0	0	0.182	0.0004	0	0.362	0.075	0.00072	24.7	0.85	6.09	0.72	0.05	53.3	3.4	9300	25485.01	0.765	0.43
Nuporanga	0.00068	11.662	0	1.592	9.294	1.863	0.712	0	0	1.049	0.93	0	0.097	0.053	0.00189	23.6	0.75	7.94	1.1	0.04	114.8	6.5	6817	70520.18	0.746	0.147
Pontal	0.00172	6.81	0	2.983	25.102	2.55	0.834	0	0	4.21	1.263	0	0.154	0.007	0	25.6	0.56	6.08	0.61	0.06	183.5	15.2	40244	23772.76	0.725	0.298
Pradópolis	0.00023	1.786	0.00055	2.649	3.309	1.226	0.401	0	0.00289	0.99	0.026	0	0.014	0.23	0	26.3	0.76	6.83	0.76	0.16	42.5	3.4	17377	40977.09	0.733	0.115
Ribeirão Corrente	0.00061	7.138	0	4.453	7.741	2.508	0.663	0	0	1.357	0.103	0	0.035	0.131	0.00238	19	0.5	6.5	0.73	0.07	101.7	10	4273	23548.05	0.711	0.234
Ribeirão Preto	0.00046	2.923	0.00009	3.775	6.148	1.602	0.605	0.00001	0.0039	2.571	0.681	0	0.345	0.16	0.00054	26	1.35	6.39	1.17	0.17	71	4.1	604682	49425.29	0.8	0.241
Rifaina	0.0025	5.429	0.00065	3.673	18.032	2.285	0.63	0	0	2.371	1.188	0	0.084	0.214	0.00176	15	NM	7	1.57	0.15	142.7	26.7	3436	33254.17	0.74	0.291
Rincão	0.00104	1.718	0.00014	3.415	10.438	2.421	0.099	0	0	0.746	0.437	0	0.018	0.167	0	8	NM	7.3	0.89	0.09	89.1	18.5	10414	18176.48	0.734	0
Sales Oliv	0.00154	5.276	0.00015	3.321	16.813	2.86	0.289	0.00088	0.00085	0.775	0.152	0	0.081	0.084	0.00059	26.1	0.62	7.51	0.75	0.05	135.8	12.5	10568	29378.39	0.772	0.379
Santa Cruz Esp	0.003	26.302	0	0.609	8.296	1.969	0.692	0	0	1.749	0.035	0	0.132	0	0	26	0.42	9.3	0.67	0.09	164.7	0	1953	24309.59	0.743	3.072
Santa Ernestina	0.0023	5.883	0	3.715	20.522	4.183	0.649	0	0	1.774	2.012	0	0.233	0.027	0	26.3	0.71	7.3	0.61	0.03	172	0	5568	16537.75	0.738	0
Santa Lúcia	0.00024	2.647	0	2.303	11.086	2.68	0.392	0	0	0.248	0.071	0	0.088	0.09	0	25.4	0.31	6.99	2.03	0.13	93.2	3.3	8248	13080.61	0.737	0.242
Santo Ant Alegria	0.00083	3.688	0.0005	2.917	13.6	2.997	0.133	0	0	0.328	0.298	0	0.123	0.041	0	18.6	0.49	6.53	1.04	0.04	114	41.7	6304	18953.27	0.702	1.269
Serrana	0.00012	3.105	0	2.369	5.835	1.874	0.162	0	0	2.022	1.429	0	0.245	0.091	0.00105	23.7	0.75	5.83	0.83	0.06	69.6	0	38878	20663.93	0.729	0.154
Sertãozinho	0.00228	10.677	0	3.367	23.936	1.638	0.556	0	0	1.569	0.069	0	2.2	0.017	0.00069	25.6	0.67	7.44	0.88	0.04	182.8	6.4	110074	44163.83	0.761	0.2
Severínia	0.0022	14.454	0.00054	2.383	27.657	7.593	0.441	0	0	8.178	5.517	0	0.95	0.013	0.0099	NM	0.31	7.53	1.1	0.1	271.8	8.7	15501	13372.83	0.715	0.258
Tabatinga	0.00283	8.675	0.00021	3.209	22.563	2.492	0.517	0	0	0.551	0.242	0	0.506	0.017	0	25.6	0.36	7	1.17	0.05	174.6	10	14686	15488.05	0.704	2.111
Taiaguá	0.0021	33.067	0	2.423	12.033	3.301	0.474	0.00004	0	3.206	2.859	0	1.677	0.059	0.00052	24.8	0.54	8	0.9	0.05	231.3	5.6	5894	15473.51	0.71	0.848
Taiuva	0.00301	8.778	0	2.345	19.375	6.319	0.455	0	0	2.454	1.341	0	0.217	0.												

Table SM 06 – Surface water raw data matrix, 10 cities, 26 variables (*Microsoft Excel®* software, version 2019).

City	Lithium mg L ⁻¹ (mean)	Sodium mg L ⁻¹ (mean)	Ammon mg L ⁻¹ (mean)	Potass mg L ⁻¹ (mean)	Calcium mg L ⁻¹ (mean)	Magnes mg L ⁻¹ (mean)	Fluoride mg L ⁻¹ (mean)	Chlorite mg L ⁻¹ (mean)	Bromate mg L ⁻¹ (mean)	Chloride mg L ⁻¹ (mean)	Nitrate mg L ⁻¹ (mean)	AMPA mg L ⁻¹ (mean)	Sulfate mg L ⁻¹ (mean)	Phosph mg L ⁻¹ (mean)	Glyphos mg L ⁻¹ (mean)	Temp °C (mean)	FRC mg L ⁻¹ (mean)	pH (mean)	Color Pt-Co (mean)	Turb NTU (mean)	Cond µS cm ⁻¹ (mean)	%MB+	NINH	GDPpc R\$	MHDI	HOSP
Cajuru	0	8.485	0	0.663	2.104	0.858	0.658	0	0	8.748	0.151	0	0.573	0.065	0.0027	24.1	1.19	7.65	5.73	0.48	60.6	1	23371	22061.52	0.713	1.712
Cass Coq	0	6.93	0	1.386	2.474	1.143	0.618	0	0	8.584	0.445	0	1.296	0.003	0.0034	23.1	0.75	6.83	3.96	0.21	62.9	2.2	2634	58581.94	0.734	1.139
Colômbia	0.00018	15.288	0	2.581	10.431	3.129	0.692	0.0004	0	11.988	1.812	0	1.888	0.045	0.00157	24.7	1	8.35	1.68	0.06	159.6	1.7	5994	53207.43	0.71	0.167
Guaíra	0.00186	18.815	0.00009	0.586	4.807	1.627	0.591	0	0	7.976	0.107	0	1.457	0.049	0.0016	28.3	0.74	7.03	1.67	0.1	125.3	0.9	37404	80169.84	0.753	1.818
Guaraci	0	4.916	0.0001	2.535	3.572	1.577	0.87	0.00039	0	9.209	0.107	0	0.646	0	0	NM	1.05	6.71	12.4	1.56	67.1	30.8	9976	29683.17	0.737	0.1
Ituverava	0	3.165	0.00015	1.823	8.059	1.615	0.661	0.0001	0	6.757	0.66	0	5.633	0.01	0	25.4	0.74	6.96	4.94	0.52	80.8	12.5	38695	36651.33	0.765	0.853
Porto Ferr	0.00057	14.047	0.0003	3.341	4.894	1.632	0.706	0	0.00008	17.408	1.357	0	3.63	0.004	0.00494	27.2	0.82	6.68	3.1	0.31	124	3.5	51400	36767.59	0.751	0.447
Restinga	0.00007	3.625	0	3.49	6.75	1.742	0.664	0	0	3.642	0.205	0	0.386	0.066	0	19.9	1.46	7.53	0.83	0.12	76.7	3.1	6587	22126.48	0.705	0
Santa Ri Pass Qua	0	8.846	0	1.373	12.353	2.373	0.571	0.00507	0.00044	19.608	1.054	0	1.248	0.255	0.0139	23.8	0.78	6.78	2.39	0.28	138.4	11.7	26478	24132.89	0.775	0.718
Santa Ro Viterbo	0	10.663	0	2.005	2.335	1.252	0.623	0.0001	0	12.661	0.795	0	4.805	0	0.00252	24.6	1.57	7.66	3.28	0.23	84.6	2.1	23862	26438.67	0.77	0.503

Table SM 07 – Groundwater + surface water raw data matrix, 28 cities, 26 variables (*Microsoft Excel®* software, version 2019).

City	Lithium mg L ⁻¹ (mean)	Sodium mg L ⁻¹ (mean)	Ammon mg L ⁻¹ (mean)	Potass mg L ⁻¹ (mean)	Calcium mg L ⁻¹ (mean)	Magnes mg L ⁻¹ (mean)	Fluoride mg L ⁻¹ (mean)	Chlorite mg L ⁻¹ (mean)	Bromate mg L ⁻¹ (mean)	Chloride mg L ⁻¹ (mean)	Nitrate mg L ⁻¹ (mean)	AMPA mg L ⁻¹ (mean)	Sulfate mg L ⁻¹ (mean)	Phosph mg L ⁻¹ (mean)	Glyphos mg L ⁻¹ (mean)	Temp °C (mean)	FRC mg L ⁻¹ (mean)	pH (mean)	Color Pt-Co (mean)	Turb NTU (mean)	Cond µS cm ⁻¹ (mean)	%MB+	NINH	GDPpc R\$	MHDI	HOSP
Altinópolis	0.00016	1.765	0.00077	1.564	1.798	0.864	0.674	0	0	2.278	1.262	0	0.02378	0.01374	0	23.7	0.7	6.41	1.42	0.1	34	4.2	15607	30792.08	0.73	0.32
Araraquara	0.00049	2.636	0.00005	3.432	7.743	1.43	0.678	0	0.00006	2.872	0.232	0	0.3	0.188	0.0014	24.4	0.84	7.01	1.47	0.13	73.9	6.5	208662	40253.93	0.815	0.206
Barretos	0.00197	27.997	0	1.735	7.412	0.947	0.63	0	0.0005	7.157	0.349	0	7.913	0.11	0.00124	27.6	0.76	8.21	1.15	0.17	172.7	0.6	112101	40046.22	0.789	0.143
Batatais	0.00029	3.585	0	4.749	4.614	1.044	0.487	0	0.00195	1.221	0.237	0	0.908	0.048	0	26.2	0.58	6.78	1.53	0.09	62.7	0.7	56476	25636.34	0.761	0.992
Bebedouro	0.0021	15.019	0.007	3.725	14.459	3.54	0.622	0	0.00002	4.853	1.258	0	3.471	0.113	0.00129	26.1	0.82	7.3	1.36	0.11	176.9	1.4	75035	43191.17	0.78	0.08
Borborema	0.00689	62.564	0.00293	3.384	4.624	1.4	0.533	0.00025	0.00042	5.478	1.459	0	1.933	0.078	0	26	0.69	9.52	2.69	0.32	318	19.7	14529	23374.91	0.73	0.344
Cravinhos	0.00019	1.611	0.00053	3.676	2.671	1.3	0.322	0.00018	0	0.483	0.081	0	0.019	0.044	0	27.2	0.22	6.81	1.24	0.17	42.4	21.2	31691	34165.63	0.756	0.252
Crist Pta	0.00003	10.983	0	2.42	6.003	1.172	0.541	0	0	11.119	0.227	0	0.236	0.012	0	22.3	1.34	7.27	0.91	0.06	102.4	12.5	7588	22617.1	0.734	0.132
Descalvado	0.00219	13.705	0	1.345	3.743	0.648	0.634	0	0	2.007	0.809	0	1.086	0.038	0.00213	24.7	0.81	7.26	1.69	0.13	88.9	3.4	31056	47327.8	0.76	0.869
Ibitinga	0.01517	100.29	0.00358	0.752	2.43	0.513	0.686	0.0007	0.00001	9.465	0.355	0	22.976	0.016	0.003	28.1	0.41	9.69	1.02	0.1	453.5	23.4	53158	25630.47	0.747	0.038
Ipuã	0	7.714	0	0.593	7.177	1.836	0.483	0	0.00072	3.973	0.787	0	0.559	0.033	0	26.4	0.42	8.02	2.03	0.24	88	10.3	14148	22139.12	0.749	0.071
Itápolis	0.00963	41.947	0.00047	1.375	6.299	1.649	0.31	0	0	2.74	1.477	0	3.223	0.058	0	26.4	0.56	8.61	1.85	0.17	219.9	2.5	40051	30504.92	0.744	0.999
Jaboticabal	0.0019	7.157	0.00022	3.127	16.39	2.603	0.545	0.00024	0.00027	16.269	0.774	0	0.88	0.024	0.00217	26.7	0.94	7.25	2.15	0.16	155.2	3.2	71662	37818.06	0.778	0.223
Jardinópolis	0.00099	2.474	0	8.578	6.593	1.57	0.451	0	0	0.139	0.033	0	0.024	0.345	0	29.5	0.51	7.02	1.12	0.08	81.2	3	37661	25060.21	0.735	0.186
Morro Agudo	0.00414	36.686	0	1.11	12.047	1.183	0.624	0.00017	0	4.41	0.456	0	15.143	0.007	0	26.3	1.06	7.84	1.22	0.06	235.2	3.7	29116	36037.1	0.712	1.236
Olimpia	0.00128	27.919	0.00009	3.355	14.23	2.957	0.577	0.00146	0.00009	6.931	1.873	0	11.149	0.208	0.00179	26.4	0.79	7.55	1.74	0.27	231.5	3.1	50024	37387.02	0.773	0.54
Orlândia	0.0008	5.569	0.00137	3.078	15.951	2.031	0.063	0	0.00041	3.485	0.259	0	8.246	0.003	0.00128	25.5	1.45	8.33	3.13	0.71	132.2	4.2	39781	42003.28	0.78	1.031
Patr Pta	0.00098	8.882	0	3.488	19.201	2.669	0.539	0	0.00167	3.534	0.216	0	2.297	0.004	0.01248	27.3	0.58	8.17	3.27	0.4	164	0	13000	60792.11	0.73	0.154
Pedregulho	0	8.584	0	2.445	4.159	1.803	0.643	0	0	8.846	0.414	0	0.499	0.04	0	28	0.5	7.2	1.27	0.13	85.7	0	15700	52418.86	0.715	0.446
Pitangueiras	0.01371	40.456	0	1.091	6.226	0.606	0.626	0.00002	0	6.945	0.076	0	1.638	0.007	0	30.7	0.92	8.42	1.12	0.07	213.5	4.1	35307	27053.73	0.723	0.736
Ribeirão Bonito	0.00021	1.349	0.00106	2.176	2.894	1.214	0.037	0	0	1.306	1.533	0	0.12	0.074	0.00195	24	0.7	6.88	3.89	0.6	40.8	74.1	12135	19500.82	0.712	0.412
São Carlos	0.00059	4.246	0.00029	2.833	4.658	1.237	0.658	0	0.00021	3.489	0.732	0	2.523	0.067	0.00157	23.9	1.12	6.87	3	0.37	65	3.6	221950	44796.83	0.805	0.167
São Joaquim Barra	0.00048	7.91	0.00291	1.632	8.08	2.072	0.49	0	0	2.508	0.361	0	0.992	0.022	0.00113	21.2	0.88	7.07	2.72	0.48	96.8	8	46512	33011.12	0.762	0
São Jose B Vista	0.00079	26.054	0.00033	2.024	5.684	1.005	1.082	0	0.00006	3.007	0.195	0	0.623	0.033	0	23.4	0.65	8.82	2.53	0.34	152.2	16.7	8406	18219.25	0.693	0.119
São Simão	0	2.196	0.00001	1.68	3.268	1.361	0.566	0	0	1.521	1.489	0	0.409	0.006	0	27.5	0.65	6.35	0.39	0.06	46.9	0	14346	29049.13	0.766	1.324
Serra Azul	0.00025	8.282	0	1.452	2.13	0.675	0.67	0	0	1.497	0.989	0	0.027	0.029	0	20.8	0.51	6	0.9	0.08	57.7	9.7	11256	10758.97	0.686	0.089
Taquaritinga	0.00454	13.273	0	2.806	19.079	4.264	0.622	0	0	2.825	0.687	0	2.824	0.016	0	29.8	0.37	7.69	1.55	0.49	191.3	3	53988	27561.71	0.748	0.019
Viradouro	0	4.814	0.00034	2.082	3.741	1.328	0.706	0	0.0009	5.904	0.093	0	0.343	0	0	25.3	0.65	7	5.11	0.56	60.3	3.7	17297	18419.26	0.739	0.347

Table SM 08 – Correlation matrix, groundwater, 51 cites, 26 variables (The Unscrambler® software, version 10.3).

	Li ⁺	Na ⁺	NH ₄ ⁺	K ⁺	Ca ²⁺	Mg ²⁺	F	ClO ₂ ⁻	BrO ₃ ⁻	Cl ⁻	NO ₃ ⁻	AMPA	SO ₄ ²⁻	PO ₄ ³⁻	Glyph	Temp	FRC	pH	Color	Turb	Cond	%MB+	NINH	GDPpc	MHDI	HOSP
Li ⁺	1.000	0.537	-0.017	-0.324	0.430	0.370	0.306	-0.057	-0.165	0.242	0.116		0.171	-0.430	-0.034	0.074	0.018	0.383	0.130	-0.061	0.674	-0.014	-0.079	-0.139	0.266	0.173
Na ⁺	0.537	1.000	-0.064	-0.465	0.010	0.069	0.277	-0.104	-0.128	0.198	0.121		0.473	-0.319	0.074	0.121	0.006	0.555	0.044	-0.188	0.703	-0.024	-0.079	-0.168	-0.070	0.287
NH ₄ ⁺	-0.017	-0.064	1.000	0.174	0.046	0.039	-0.175	0.117	0.512	0.022	0.135		-0.084	0.114	-0.063	0.101	-0.252	0.000	0.456	0.311	0.005	0.414	-0.036	-0.145	-0.089	-0.084
K ⁺	-0.324	-0.465	0.174	1.000	-0.144	-0.249	0.009	0.175	0.287	-0.195	-0.161		-0.291	0.558	-0.057	0.015	-0.023	-0.285	-0.108	0.219	-0.400	0.177	0.078	0.242	0.087	-0.246
Ca ²⁺	0.430	0.010	0.046	-0.144	1.000	0.660	0.217	0.160	-0.192	0.473	0.422		-0.020	-0.429	0.344	0.054	-0.076	0.252	0.084	-0.097	0.694	-0.165	-0.075	-0.161	0.087	0.208
Mg ²⁺	0.370	0.069	0.039	-0.249	0.660	1.000	0.173	0.021	-0.164	0.731	0.665		0.044	-0.373	0.350	-0.066	0.074	0.175	0.321	0.025	0.629	-0.098	-0.148	-0.193	0.223	0.261
F	0.306	0.277	-0.175	0.009	0.217	0.173	1.000	-0.196	-0.091	0.297	0.129		0.237	-0.133	0.164	0.189	0.409	0.124	0.049	-0.013	0.363	-0.271	0.087	0.002	0.175	0.182
ClO ₂ ⁻	-0.057	-0.104	0.117	0.175	0.160	0.021	-0.196	1.000	0.061	-0.014	0.043		-0.099	0.179	-0.026	0.215	-0.189	-0.045	-0.208	-0.069	0.029	-0.039	-0.033	0.305	-0.005	-0.063
BrO ₃ ⁻	-0.165	-0.128	0.512	0.287	-0.192	-0.164	-0.091	0.061	1.000	-0.073	-0.058		-0.105	0.295	-0.132	0.215	0.175	-0.109	0.209	0.534	-0.212	0.099	0.532	-0.002	0.228	-0.085
Cl ⁻	0.242	0.198	0.022	-0.195	0.473	0.731	0.297	-0.014	-0.073	1.000	0.857		0.149	-0.211	0.532	0.043	0.049	0.098	0.111	0.063	0.580	-0.216	0.011	-0.132	0.071	0.409
NO ₃ ⁻	0.116	0.121	0.135	-0.161	0.422	0.665	0.129	0.043	-0.058	0.857	1.000		0.005	-0.250	0.531	0.048	-0.192	0.023	0.140	0.075	0.490	-0.177	-0.087	-0.190	-0.078	0.309
AMPA												1.000														
SO ₄ ²⁻	0.171	0.473	-0.084	-0.291	-0.020	0.044	0.237	-0.099	-0.105	0.149	0.005		1.000	-0.147	0.028	0.135	0.129	0.269	-0.005	-0.197	0.321	-0.020	-0.012	-0.159	-0.153	0.128
PO ₄ ³⁻	-0.430	-0.319	0.114	0.558	-0.429	-0.373	-0.133	0.179	0.295	-0.211	-0.250		-0.147	1.000	-0.038	-0.151	-0.004	-0.229	-0.122	0.204	-0.508	0.290	0.102	0.532	-0.072	-0.208
Glyph	-0.034	0.074	-0.063	-0.057	0.344	0.350	0.164	-0.026	-0.132	0.532	0.531		0.028	-0.038	1.000	-0.039	-0.109	0.066	-0.013	-0.072	0.329	-0.120	-0.002	0.040	0.068	0.419
Temp	0.074	0.121	0.101	0.015	0.054	-0.066	0.189	0.215	0.215	0.043	0.048		0.135	-0.151	-0.039	1.000	-0.100	0.088	-0.122	0.033	0.108	-0.294	0.087	0.074	0.121	0.121
FRC	0.018	0.006	-0.252	-0.023	-0.076	0.074	0.409	-0.189	0.175	0.049	-0.192		0.129	-0.004	-0.109	-0.100	1.000	-0.045	-0.019	0.025	-0.028	-0.265	0.389	0.057	0.316	0.082
pH	0.383	0.555	0.000	-0.285	0.252	0.175	0.124	-0.045	-0.109	0.098	0.023		0.269	-0.229	0.066	0.088	-0.045	1.000	0.000	-0.172	0.542	0.014	-0.141	-0.204	0.002	0.408
Color	0.130	0.044	0.456	-0.108	0.084	0.321	0.049	-0.208	0.209	0.111	0.140		-0.005	-0.122	-0.013	-0.122	-0.019	0.000	1.000	0.595	0.143	0.159	-0.007	-0.251	0.168	-0.005
Turb	-0.061	-0.188	0.311	0.219	-0.097	0.025	-0.013	-0.069	0.534	0.063	0.075		-0.197	0.204	-0.072	0.033	0.025	-0.172	0.595	1.000	-0.159	0.035	0.169	-0.082	0.135	-0.129
Cond	0.674	0.703	0.005	-0.400	0.694	0.629	0.363	0.029	-0.212	0.580	0.490		0.321	-0.508	0.329	0.108	-0.028	0.542	0.143	-0.159	1.000	-0.124	-0.123	-0.239	0.047	0.362
%MB+	-0.014	-0.024	0.414	0.177	-0.165	-0.098	-0.271	-0.039	0.099	-0.216	-0.177		-0.020	0.290	-0.120	-0.294	-0.265	0.014	0.159	0.035	-0.124	1.000	-0.107	-0.026	-0.127	-0.159
NINH	-0.079	-0.079	-0.036	0.078	-0.075	-0.148	0.087	-0.033	0.532	0.011	-0.087		-0.012	0.102	-0.002	0.087	0.389	-0.141	-0.007	0.169	-0.123	-0.107	1.000	0.092	0.412	-0.065
GDPpc	-0.139	-0.168	-0.145	0.242	-0.161	-0.193	0.002	0.305	-0.002	-0.132	-0.190		-0.159	0.532	0.040	0.074	0.057	-0.204	-0.251	-0.082	-0.239	-0.026	0.092	1.000	0.127	-0.152
MHDI	0.266	-0.070	-0.089	0.087	0.087	0.223	0.175	-0.005	0.228	0.071	-0.078		-0.153	-0.072	0.068	0.121	0.316	0.002	0.168	0.135	0.047	-0.127	0.412	0.127	1.000	0.042
HOSP	0.173	0.287	-0.084	-0.246	0.208	0.261	0.182	-0.063	-0.085	0.409	0.309		0.128	-0.208	0.419	0.121	0.082	0.408	-0.005	-0.129	0.362	-0.159	-0.065	-0.152	0.042	1.000

	Li ⁺	Na ⁺	NH ₄ ⁺	K ⁺	Ca ²⁺	Mg ²⁺	F	ClO ₂ ⁻	BrO ₃ ⁻	Cl ⁻	NO ₃ ⁻	AMPA	SO ₄ ²⁻	PO ₄ ³⁻	Glyph	Temp	FRC	pH	Color	Turb	Cond	%MB+	NINH	GDPpc	MHDI	HOSP
Li ⁺	1.000	0.746	0.316	-0.299	-0.075	0.029	-0.250	-0.186	-0.128	-0.054	-0.155		-0.064	-0.066	-0.098	0.688	-0.357	-0.147	-0.312	-0.282	0.400	-0.291	0.459	0.755	0.141	0.492
Na ⁺	0.746	1.000	0.172	-0.219	0.046	0.312	-0.284	-0.043	0.013	0.392	0.393		0.016	0.015	0.151	0.733	-0.226	0.225	-0.426	-0.451	0.712	-0.486	0.353	0.635	0.094	0.321
NH ₄ ⁺	0.316	0.172	1.000	0.347	-0.072	-0.084	0.337	-0.236	-0.075	0.241	0.186		0.447	-0.357	-0.090	0.619	-0.426	-0.539	0.169	0.224	0.144	0.194	0.754	0.102	0.308	-0.072
K ⁺	-0.299	-0.219	0.347	1.000	0.171	0.322	0.501	-0.183	-0.125	0.029	0.370		0.116	-0.255	-0.224	-0.334	0.330	0.075	-0.031	0.092	0.102	0.173	-0.111	-0.358	-0.261	-0.897
Ca ²⁺	-0.075	0.046	-0.072	0.171	1.000	0.861	-0.222	0.678	0.636	0.360	0.572		0.021	0.678	0.475	-0.093	-0.317	0.116	-0.391	-0.259	0.712	0.087	0.031	-0.049	0.138	-0.327
Mg ²⁺	0.029	0.312	-0.084	0.322	0.861	1.000	0.008	0.427	0.364	0.345	0.715		-0.056	0.402	0.250	0.011	-0.200	0.350	-0.338	-0.231	0.838	0.048	-0.155	0.153	-0.077	-0.480
F	-0.250	-0.284	0.337	0.501	-0.222	0.008	1.000	-0.332	-0.367	-0.158	-0.094		-0.136	-0.468	-0.475	-0.024	0.129	-0.104	0.788	0.829	-0.257	0.716	-0.202	-0.243	-0.316	-0.522
ClO ₂ ⁻	-0.186	-0.043	-0.236	-0.183	0.678	0.427	-0.332	1.000	0.974	0.654	0.264		-0.177	0.924	0.899	-0.117	-0.258	-0.248	-0.123	-0.035	0.425	0.235	0.041	-0.274	0.445	-0.070
BrO ₃ ⁻	-0.128	0.013	-0.075	-0.125	0.636	0.364	-0.367	0.974	1.000	0.738	0.306		-0.121	0.901	0.953	-0.045	-0.303	-0.342	-0.188	-0.097	0.448	0.155	0.195	-0.280	0.488	-0.045
Cl ⁻	-0.054	0.392	0.241	0.029	0.360	0.345	-0.158	0.654	0.738	1.000	0.658		0.177	0.476	0.819	0.350	-0.258	-0.212	-0.107	-0.084	0.594	0.026	0.387	-0.157	0.524	-0.118
NO ₃ ⁻	-0.155	0.393	0.186	0.370	0.572	0.715	-0.094	0.264	0.306	0.658	1.000		0.379	0.146	0.356	0.204	-0.167	0.315	-0.388	-0.375	0.753	-0.227	0.146	0.017	0.120	-0.410
AMPA												1.000														
SO ₄ ²⁻	-0.064	0.016	0.447	0.116	0.021	-0.056	-0.136	-0.177	-0.121	0.177	0.379		1.000	-0.355	-0.107	0.416	-0.049	-0.046	-0.108	-0.132	0.075	-0.082	0.566	-0.031	0.613	-0.079
PO ₄ ³⁻	-0.066	0.015	-0.357	-0.255	0.678	0.402	-0.468	0.924	0.901	0.476	0.146		-0.355	1.000	0.828	-0.216	-0.165	-0.071	-0.312	-0.220	0.422	0.010	0.014	-0.248	0.212	0.077
Glyph	-0.098	0.151	-0.090	-0.224	0.475	0.250	-0.475	0.899	0.953	0.819	0.356		-0.107	0.828	1.000	0.029	-0.312	-0.306	-0.254	-0.219	0.436	-0.038	0.213	-0.195	0.479	0.095
Temp	0.688	0.733	0.619	-0.334	-0.093	0.011	-0.024	-0.117	-0.045	0.350	0.204		0.416	-0.216	0.029	1.000	-0.532	-0.273	0.150	0.107	0.436	-0.044	0.755	0.560	0.484	0.465
FRC	-0.357	-0.226	-0.426	0.330	-0.317	-0.200	0.129	-0.258	-0.303	-0.258	-0.167		-0.049	-0.165	-0.312	-0.532	1.000	0.560	-0.025	-0.012	-0.340	-0.138	-0.357	-0.562	-0.316	-0.380
pH	-0.147	0.225	-0.539	0.075	0.116	0.350	-0.104	-0.248	-0.342	-0.212	0.315		-0.046	-0.071	-0.306	-0.273	0.560	1.000	-0.366	-0.413	0.215	-0.484	-0.403	-0.045	-0.545	-0.144
Color	-0.312	-0.426	0.169	-0.031	-0.391	-0.338	0.788	-0.123	-0.188	-0.107	-0.388		-0.108	-0.312	-0.254	0.150	-0.025	-0.366	1.000	0.973	-0.524	0.829	-0.137	-0.263	0.019	-0.103
Turb	-0.282	-0.451	0.224	0.092	-0.259	-0.231	0.829	-0.035	-0.097	-0.084	-0.375		-0.132	-0.220	-0.219	0.107	-0.012	-0.413	0.973	1.000	-0.444	0.915	-0.099	-0.322	0.044	-0.228
Cond	0.400	0.712	0.144	0.102	0.712	0.838	-0.257	0.425	0.448	0.594	0.753		0.075	0.422	0.436	0.436	-0.340	0.215	-0.524	-0.444	1.000	-0.227	0.267	0.348	0.175	-0.136
%MB+	-0.291	-0.486	0.194	0.173	0.087	0.048	0.716	0.235	0.155	0.026	-0.227		-0.082	0.010	-0.038	-0.044	-0.138	-0.484	0.829	0.915	-0.227	1.000	-0.108	-0.300	0.209	-0.386
NINH	0.459	0.353	0.754	-0.111	0.031	-0.155	-0.202	0.041	0.195	0.387	0.146		0.566	0.014	0.213	0.755	-0.357	-0.403	-0.137	-0.099	0.267	-0.108	1.000	0.064	0.603	0.330
GDPpc	0.755	0.635	0.102	-0.358	-0.049	0.153	-0.243	-0.274	-0.280	-0.157	0.017		-0.031	-0.248	-0.195	0.560	-0.562	-0.045	-0.263	-0.322	0.348	-0.300	0.064	1.000	0.020	0.448
MHDI	0.141	0.094	0.308	-0.261	0.138	-0.077	-0.316	0.445	0.488	0.524	0.120		0.613	0.212	0.479	0.484	-0.316	-0.545	0.019	0.044	0.175	0.209	0.603	0.020	1.000	0.149
HOSP	0.492	0.321	-0.072	-0.897	-0.327	-0.480	-0.522	-0.070	-0.045	-0.118	-0.410		-0.079	0.077	0.095	0.465	-0.380	-0.144	-0.103	-0.228	-0.136	-0.386	0.330	0.448	0.149	1.000

Table SM 10 – Correlation matrix, surface water + groundwater, 28 cites, 26 variables (The Unscrambler® software, version 10.3).

	Li ⁺	Na ⁺	NH ₄ ⁺	K ⁺	Ca ²⁺	Mg ²⁺	F	ClO ₂ ⁻	BrO ₃ ⁻	Cl ⁻	NO ₃ ⁻	AMPA	SO ₄ ²⁻	PO ₄ ³⁻	Glyph	Temp	FRC	pH	Color	Turb	Cond	%MB+	NINH	GDPpc	MHDI	HOSP
Li ⁺	1.000	0.861	0.250	-0.294	-0.037	-0.167	0.068	0.246	-0.196	0.261	0.004		0.543	-0.134	-0.003	0.470	-0.104	0.695	-0.211	-0.207	0.811	0.038	-0.029	-0.123	-0.123	0.108
Na ⁺	0.861	1.000	0.349	-0.318	-0.090	-0.214	0.207	0.451	-0.154	0.331	0.087		0.728	-0.086	0.023	0.278	-0.109	0.813	-0.174	-0.188	0.937	0.101	-0.082	-0.145	-0.162	0.006
NH ₄ ⁺	0.250	0.349	1.000	0.014	0.090	0.258	-0.047	0.090	-0.156	0.066	0.221		0.263	0.020	0.033	-0.089	0.043	0.255	0.050	0.074	0.392	0.149	0.028	0.046	0.154	-0.255
K ⁺	-0.294	-0.318	0.014	1.000	0.211	0.288	-0.191	0.012	0.208	-0.197	-0.195		-0.244	0.722	0.070	0.250	-0.075	-0.203	-0.007	-0.013	-0.191	-0.115	0.156	0.113	0.187	-0.124
Ca ²⁺	-0.037	-0.090	0.090	0.211	1.000	0.822	-0.107	0.166	0.196	0.247	-0.021		0.190	0.031	0.458	0.283	0.256	0.203	0.124	0.313	0.255	-0.327	0.097	0.463	0.264	-0.055
Mg ²⁺	-0.167	-0.214	0.258	0.288	0.822	1.000	-0.124	0.170	0.054	0.115	0.221		-0.038	0.133	0.235	0.254	-0.047	-0.003	0.119	0.337	0.097	-0.228	0.057	0.330	0.272	-0.223
F	0.068	0.207	-0.047	-0.191	-0.107	-0.124	1.000	0.056	-0.066	0.197	-0.185		0.042	-0.057	-0.060	-0.064	-0.136	0.084	-0.209	-0.367	0.160	-0.408	0.134	-0.054	-0.142	-0.289
ClO ₂ ⁻	0.246	0.451	0.090	0.012	0.166	0.170	0.056	1.000	-0.117	0.318	0.361		0.592	0.276	0.094	0.146	-0.055	0.249	-0.101	-0.060	0.522	0.039	-0.004	0.028	0.127	-0.004
BrO ₃ ⁻	-0.196	-0.154	-0.156	0.208	0.196	0.054	-0.066	-0.117	1.000	-0.058	-0.261		-0.096	-0.153	0.463	0.094	-0.105	0.057	0.368	0.188	-0.088	-0.197	-0.037	0.149	0.084	0.069
Cl ⁻	0.261	0.331	0.066	-0.197	0.247	0.115	0.197	0.318	-0.058	1.000	-0.066		0.282	-0.187	0.074	0.145	0.313	0.304	-0.047	-0.160	0.423	-0.129	0.036	0.136	0.106	-0.193
NO ₃ ⁻	0.004	0.087	0.221	-0.195	-0.021	0.221	-0.185	0.361	-0.261	-0.066	1.000		0.009	0.084	-0.091	-0.150	-0.059	-0.087	-0.035	-0.006	0.093	0.218	-0.106	-0.082	0.018	0.197
AMPA												1.000														
SO ₄ ²⁻	0.543	0.728	0.263	-0.244	0.190	-0.038	0.042	0.592	-0.096	0.282	0.009		1.000	-0.033	0.146	0.245	0.103	0.541	-0.164	-0.057	0.768	-0.003	0.082	0.116	0.094	0.133
PO ₄ ³⁻	-0.134	-0.086	0.020	0.722	0.031	0.133	-0.057	0.276	-0.153	-0.187	0.084		-0.033	1.000	-0.082	0.184	-0.110	-0.103	-0.171	-0.183	-0.035	-0.022	0.335	0.035	0.267	-0.181
Glyph	-0.003	0.023	0.033	0.070	0.458	0.235	-0.060	0.094	0.463	0.074	-0.091		0.146	-0.082	1.000	0.074	-0.007	0.182	0.291	0.220	0.167	-0.011	0.039	0.581	0.079	-0.178
Temp	0.470	0.278	-0.089	0.250	0.283	0.254	-0.064	0.146	0.094	0.145	-0.150		0.245	0.184	0.074	1.000	-0.336	0.352	-0.254	-0.172	0.379	-0.229	-0.034	0.222	0.091	0.192
FRC	-0.104	-0.109	0.043	-0.075	0.256	-0.047	-0.136	-0.055	-0.105	0.313	-0.059		0.103	-0.110	-0.007	-0.336	1.000	0.008	0.152	0.171	-0.028	-0.122	0.258	0.221	0.295	0.257
pH	0.695	0.813	0.255	-0.203	0.203	-0.003	0.084	0.249	0.057	0.304	-0.087		0.541	-0.103	0.182	0.352	0.008	1.000	0.100	0.143	0.846	0.062	-0.103	0.023	-0.096	-0.035
Color	-0.211	-0.174	0.050	-0.007	0.124	0.119	-0.209	-0.101	0.368	-0.047	-0.035		-0.164	-0.171	0.291	-0.254	0.152	0.100	1.000	0.837	-0.131	0.312	-0.014	0.001	-0.015	-0.129
Turb	-0.207	-0.188	0.074	-0.013	0.313	0.337	-0.367	-0.060	0.188	-0.160	-0.006		-0.057	-0.183	0.220	-0.172	0.171	0.143	0.837	1.000	-0.081	0.331	-0.024	0.015	0.056	-0.133
Cond	0.811	0.937	0.392	-0.191	0.255	0.097	0.160	0.522	-0.088	0.423	0.093		0.768	-0.035	0.167	0.379	-0.028	0.846	-0.131	-0.081	1.000	-0.008	-0.041	0.015	-0.052	-0.033
%MB+	0.038	0.101	0.149	-0.115	-0.327	-0.228	-0.408	0.039	-0.197	-0.129	0.218		-0.003	-0.022	-0.011	-0.229	-0.122	0.062	0.312	0.331	-0.008	1.000	-0.195	-0.402	-0.316	-0.172
NINH	-0.029	-0.082	0.028	0.156	0.097	0.057	0.134	-0.004	-0.037	0.036	-0.106		0.082	0.335	0.039	-0.034	0.258	-0.103	-0.014	-0.024	-0.041	-0.195	1.000	0.352	0.765	-0.187
GDPpc	-0.123	-0.145	0.046	0.113	0.463	0.330	-0.054	0.028	0.149	0.136	-0.082		0.116	0.035	0.581	0.222	0.221	0.023	0.001	0.015	0.015	-0.402	0.352	1.000	0.468	0.108
MHDI	-0.123	-0.162	0.154	0.187	0.264	0.272	-0.142	0.127	0.084	0.106	0.018		0.094	0.267	0.079	0.091	0.295	-0.096	-0.015	0.056	-0.052	-0.316	0.765	0.468	1.000	0.001
HOSP	0.108	0.006	-0.255	-0.124	-0.055	-0.223	-0.289	-0.004	0.069	-0.193	0.197		0.133	-0.181	-0.178	0.192	0.257	-0.035	-0.129	-0.133	-0.033	-0.172	-0.187	0.108	0.001	1.000

Table SM 11 – Linear Discriminant Analysis, groundwater contamination by nitrate, 5 variables

MODELLING										TEST 2							
Raw data (2015-2016)							LDF scores		TEST 1	Raw data (2019-2020)					LDF scores		Classification
City	Designated	Ca ²⁺	Mg ²⁺	Cl ⁻	N-NO ₃ ⁻	Cond	High nitrate	Low nitrate	Prediction	Ca ²⁺	Mg ²⁺	Cl ⁻	N-NO ₃ ⁻	Cond	High nitrate	Low nitrate	
Altair	High nitrate	20.494	4.014	4.938	3.555	163.7	13.098	6.476	High nitrate	21.524	3.728	5.105	3.579	175.1	12.476	6.566	High nitrate
Cajobi	High nitrate	20.088	4.608	3.352	2.374	222.9	13.009	7.872	High nitrate	16.248	4.128	4.009	2.311	236.3	12.045	7.769	High nitrate
Cand Rodr	High nitrate	18.085	9.269	3.073	1.013	235.1	23.902	11.455	High nitrate	16.943	8.478	3.667	1.305	239.7	22.663	11.057	High nitrate
Dobrada	High nitrate	19.422	4.055	3.88	4.342	184.2	18.262	7.291	High nitrate	19.655	3.926	2.849	2.716	192.8	11.166	6.637	High nitrate
Dourado	High nitrate	27.44	4.592	2.368	1.375	189.5	6.120	6.621	Low nitrate	27.101	4.433	1.698	0.801	188.4	3.230	6.163	Low nitrate
Igarapava	High nitrate	16.026	5.592	3.717	2.119	152.5	12.762	6.742	High nitrate	16.144	5.63	3.815	2.217	160.4	13.622	7.027	High nitrate
Mte Azul Pta	High nitrate	30.217	7.882	4.899	3.064	252.2	26.425	11.925	High nitrate	30.018	7.883	6.991	3.549	263.2	28.355	12.551	High nitrate
Sta Ernest	High nitrate	20.723	4.023	1.899	2.084	167	7.699	5.739	High nitrate	20.522	4.183	1.774	2.012	172	8.221	5.959	High nitrate
Severinia	High nitrate	31.786	7.719	8.049	6.481	274.5	40.868	14.067	High nitrate	27.657	7.593	8.178	5.517	271.8	36.595	13.419	High nitrate
Taiacu	High nitrate	15.178	4.154	3.907	4.037	214.2	19.218	7.947	High nitrate	12.033	3.301	3.206	2.859	231.3	12.463	7.066	High nitrate
Taiuva	High nitrate	19.66	6.252	2.904	1.712	181.9	14.157	7.877	High nitrate	19.375	6.319	2.454	1.341	188.3	13.199	7.904	High nitrate
Taquaral	High nitrate	23.414	6.134	4.18	3.157	198.9	19.923	8.980	High nitrate	22.941	6.126	3.111	2.448	196.9	17.075	8.539	High nitrate
Terra Roxa	High nitrate	19.549	5.183	6.054	3.04	204.4	16.299	8.335	High nitrate	20.97	5.517	7.637	3.876	232.4	21.619	9.820	High nitrate
Trabiju	High nitrate	7.061	3.093	4.025	4.236	93.6	12.576	3.932	High nitrate	7.49	3.126	4.102	4.388	102.2	13.648	4.258	High nitrate
V Aleg Alto	High nitrate	22.956	7.705	4.508	2.966	224.1	25.523	10.875	High nitrate	24.475	7.714	7.359	3.25	249.1	26.604	11.856	High nitrate
Miguelóp	High nitrate	11.622	3.518	2.621	1.797	175.6	6.287	5.317	High nitrate	12.194	3.627	3.64	2.049	184.8	7.726	5.828	High nitrate
Matão	Low nitrate	31.21	4.049	1.141	0.637	216.2	1.877	6.511	Low nitrate	31.403	4.112	1.421	0.828	228.1	3.336	6.972	Low nitrate
Am Bras	Low nitrate	9.979	3.22	1.751	0.707	101	-2.297	2.601	Low nitrate	10.65	3.221	1.826	0.756	107.9	-1.915	2.815	Low nitrate
Aramina	Low nitrate	5.213	2.287	1.117	1.61	61.1	-2.112	1.070	Low nitrate	5.331	2.343	1.041	1.439	78.2	-1.948	1.479	Low nitrate
Barrinha	Low nitrate	21.851	2.53	1.469	1.149	154	-2.280	3.739	Low nitrate	22.101	2.419	1.415	1.04	158.4	-2.990	3.712	Low nitrate
B Esp Sul	Low nitrate	22.266	1.975	0.165	0.215	134.7	-8.844	2.297	Low nitrate	12.866	1.286	0.303	0.562	85.8	-10.233	0.478	Low nitrate
Brodowski	Low nitrate	4.112	0.994	0.48	0.036	56.2	-13.495	-0.878	Low nitrate	5.02	1.37	0.555	0.24	67.7	-10.958	-0.161	Low nitrate
Buritizal	Low nitrate	17.48	2.892	1.024	0.023	145.9	-5.581	3.251	Low nitrate	17.202	3.068	0.924	0.012	147.6	-4.866	3.427	Low nitrate
Colina	Low nitrate	5.88	1.869	2.472	0.508	75.5	-8.542	0.711	Low nitrate	6.294	2.298	4.452	0.588	90.8	-6.845	1.633	Low nitrate
Dumont	Low nitrate	16.217	3.168	0.453	0.171	128.4	-4.288	3.041	Low nitrate	19.225	3.315	0.385	0.122	146.1	-3.719	3.639	Low nitrate
Gav Peix	Low nitrate	6.162	1.176	0.264	0.043	65.4	-12.703	-0.469	Low nitrate	6.378	1.193	0.633	0.048	70.5	-12.575	-0.294	Low nitrate
Guará	Low nitrate	3.641	0.341	1.228	0.318	343.5	-2.283	6.104	Low nitrate	4.849	0.453	1.117	0.374	345.5	-1.718	6.285	Low nitrate
Guariba	Low nitrate	20.487	2.478	0.673	0.073	152.2	-6.887	3.111	Low nitrate	17.979	2.075	1.084	0.131	147.9	-7.932	2.676	Low nitrate
Guatapar	Low nitrate	4.354	1.351	0.44	0.27	48.3	-11.569	-0.679	Low nitrate	4.037	1.492	0.273	0.164	48.6	-11.435	-0.615	Low nitrate
Ibat	Low nitrate	2.855	1.217	1.175	0.471	39.7	-11.514	-0.901	Low nitrate	2.94	1.387	1.61	0.702	44.9	-9.832	-0.495	Low nitrate
Itirapu	Low nitrate	14.824	3.423	1.309	0.0066	182.6	-1.900	4.607	Low nitrate	13.773	3.376	1.541	0.009	181.6	-2.004	4.542	Low nitrate
Jaborandi	Low nitrate	8.947	3.281	2.707	0.409	147.7	-1.605	3.767	Low nitrate	8.038	3.065	2.887	0.441	151	-1.978	3.682	Low nitrate
Jeriquara	Low nitrate	11.962	3.14	0.854	0.178	102.7	-4.896	2.321	Low nitrate	11.753	2.914	0.907	0.22	104	-5.414	2.184	Low nitrate
L Antnio	Low nitrate	2.388	0.983	0.72	1.177	32.6	-9.182	-1.011	Low nitrate	3.634	0.99	0.664	0.959	38.8	-10.067	-0.924	Low nitrate
Monte Alto	Low nitrate	19.363	1.657	1.629	0.024	174.9	-9.131	3.028	Low nitrate	18.191	1.469	1.096	0.023	177.6	-9.273	2.887	Low nitrate
N Europa	Low nitrate	3.38	0.74	0.138	0.002	51.5	-14.479	-1.260	Low nitrate	3.049	0.844	0.182	0.0004	53.3	-14.010	-1.130	Low nitrate
Nuporanga	Low nitrate	6.319	1.463	0.479	0.337	84.1	-9.680	0.395	Low nitrate	9.294	1.863	1.049	0.93	114.8	-5.001	1.857	Low nitrate
Pontal	Low nitrate	26.282	2.532	1.569	0.688	173.1	-4.320	4.107	Low nitrate	25.102	2.55	4.21	1.263	183.5	-1.988	4.790	Low nitrate
Pradpolis	Low nitrate	2.815	1.268	0.857	0.018	36.6	-13.399	-1.154	Low nitrate	3.309	1.226	0.99	0.026	42.5	-13.385	-1.019	Low nitrate
Rib Corr	Low nitrate	8.126	2.695	1.062	0.056	91.3	-6.909	1.557	Low nitrate	7.741	2.508	1.357	0.103	101.7	-6.939	1.700	Low nitrate
Rib Preto	Low nitrate	5.528	1.476	2.01	0.329	62.4	-11.044	-0.067	Low nitrate	6.148	1.602	2.571	0.681	71	-8.956	0.458	Low nitrate
Rifaina	Low nitrate	15.31	2.045	1.995	1.517	122.9	-2.726	2.626	Low nitrate	18.032	2.285	2.371	1.188	142.7	-3.131	3.260	Low nitrate
Rinco	Low nitrate	10.749	1.843	0.203	0.126	83.3	-10.000	0.653	Low nitrate	10.438	2.421	0.746	0.437	89.1	-6.495	1.451	Low nitrate
Sales Oliv	Low nitrate	16.517	2.432	1.536	0.106	129	-7.551	2.486	Low nitrate	16.813	2.86	0.775	0.152	135.8	-5.338	2.995	Low nitrate
Sta Cr Esp	Low nitrate	6.884	1.497	1.365	0.031	168.4	-7.738	2.519	Low nitrate	8.296	1.969	1.749	0.035	164.7	-6.630	2.869	Low nitrate
Sta Lcia	Low nitrate	9.645	2.475	0.303	0.061	80.4	-8.089	1.070	Low nitrate	11.086	2.68	0.248	0.071	93.2	-7.006	1.593	Low nitrate
Sto Ant Al	Low nitrate	11.179	2.544	0.807	0.365	97.1	-6.199	1.744	Low nitrate	13.6	2.997	0.328	0.298	114	-4.438	2.534	Low nitrate
Serrana	Low nitrate	5.56	1.831	1.316	0.773	59	-7.701	0.291	Low nitrate	5.835	1.874	2.022	1.429	69.6	-4.432	0.932	Low nitrate
Sertoz	Low nitrate	23.027	1.624	1.873	0.043	179.1	-9.684	3.190	Low nitrate	23.936	1.638	1.569	0.069	182.8	-9.398	3.302	Low nitrate
Tabatinga	Low nitrate	24.357	2.379	0.265	0.117	166.8	-6.898	3.455	Low nitrate	22.563	2.492	0.551	0.242	174.6	-5.410	3.795	Low nitrate

TEST 1 (confusion matrix)

	High nitrate	Low nitrate
High nitrate	15	0
Low nitrate	1	34

LDF (high nitrate) = - 18.645 - 0.168*Ca + 3.452*Mg - 0.372*Cl + 4.530*N-NO₃ + 0.043*Cond
LDF (low nitrate) = - 3.263 + 0.016*Ca + 0.838*Mg + 0.065*Cl + 0.432*N-NO₃ + 0.026*Cond

Table SM 12 – Linear Discriminant Analysis, groundwater contamination by nitrate, 4 variables (with “hardness”)

MODELLING									TEST 2						
			Raw data (2015-2016)			LDF scores			Raw data (2019-2020)			LDF scores			Classification
City	Designated	Hardness	Cl ⁻	N-NO ₃ ⁻	Cond	High nitrate	Low nitrate	Prediction	Hardness	Cl ⁻	N-NO ₃ ⁻	Cond	High nitrate	Low nitrate	
Altair	High nitrate	24.508	4.938	3.555	163.7	13.654	5.672	High nitrate	25.252	5.105	3.579	175.1	14.495	6.094	High nitrate
Cajobi	High nitrate	24.696	3.352	2.374	222.9	10.104	6.281	High nitrate	20.376	4.009	2.311	236.3	10.646	6.520	High nitrate
Cand Rodr	High nitrate	27.354	3.073	1.013	235.1	6.904	6.661	High nitrate	25.421	3.667	1.305	239.7	8.419	6.889	High nitrate
Dobrada	High nitrate	23.477	3.88	4.342	184.2	14.661	5.542	High nitrate	23.581	2.849	2.716	192.8	9.025	5.220	High nitrate
Dourado	High nitrate	32.032	2.368	1.375	189.5	6.053	5.675	High nitrate	31.534	1.698	0.801	188.4	3.358	5.261	Low nitrate
Igarapava	High nitrate	21.618	3.717	2.119	152.5	7.037	4.511	High nitrate	21.774	3.815	2.217	160.4	7.748	4.762	High nitrate
Mte Azul Pta	High nitrate	38.099	4.899	3.064	252.2	17.676	9.006	High nitrate	37.901	6.991	3.549	263.2	22.532	10.296	High nitrate
Sta Ernest	High nitrate	24.746	1.899	2.084	167	5.192	4.238	High nitrate	24.705	1.774	2.012	172	4.971	4.289	High nitrate
Severinia	High nitrate	39.505	8.049	6.481	274.5	32.692	11.278	High nitrate	35.25	8.178	5.517	271.8	29.467	10.868	High nitrate
Taiacu	High nitrate	19.332	3.907	4.037	214.2	14.184	5.872	High nitrate	15.334	3.206	2.859	231.3	9.831	5.537	High nitrate
Taiuva	High nitrate	25.912	2.904	1.712	181.9	6.451	5.195	High nitrate	25.694	2.454	1.341	188.3	4.944	5.097	Low nitrate
Taquaral	High nitrate	29.548	4.18	3.157	198.9	13.505	6.591	High nitrate	29.067	3.111	2.448	196.9	9.808	5.957	High nitrate
Terra Roxa	High nitrate	24.732	6.054	3.04	204.4	15.416	7.204	High nitrate	26.487	7.637	3.876	232.4	21.355	8.829	High nitrate
Trabiju	High nitrate	10.154	4.025	4.236	93.6	9.175	2.229	High nitrate	10.616	4.102	4.388	102.2	10.076	2.516	High nitrate
V Aleg Alto	High nitrate	30.661	4.508	2.966	224.1	14.552	7.451	High nitrate	32.189	7.359	3.25	249.1	20.815	9.609	High nitrate
Miguelóp	High nitrate	15.14	2.621	1.797	175.6	4.146	3.900	High nitrate	15.821	3.64	2.049	184.8	6.821	4.692	High nitrate
Matão	Low nitrate	35.259	1.141	0.637	216.2	3.663	5.986	Low nitrate	35.515	1.421	0.828	228.1	5.057	6.433	Low nitrate
Am Bras	Low nitrate	13.199	1.751	0.707	101	-3.004	1.510	Low nitrate	13.871	1.826	0.756	107.9	-2.404	1.774	Low nitrate
Aramina	Low nitrate	7.5	1.117	1.61	61.1	-3.914	-0.269	Low nitrate	7.674	1.041	1.439	78.2	-3.875	0.110	Low nitrate
Barrinha	Low nitrate	24.381	1.469	1.149	154	1.515	3.671	Low nitrate	24.52	1.415	1.04	158.4	1.314	3.760	Low nitrate
B Esp Sul	Low nitrate	24.241	0.165	0.215	134.7	-3.679	2.540	Low nitrate	14.152	0.303	0.562	85.8	-5.970	0.516	Low nitrate
Brodowski	Low nitrate	5.106	0.48	0.036	56.2	-9.702	-0.946	Low nitrate	6.39	0.555	0.24	67.7	-8.422	-0.515	Low nitrate
Buritizal	Low nitrate	20.372	1.024	0.023	145.9	-3.168	2.869	Low nitrate	20.27	0.924	0.012	147.6	-3.311	2.850	Low nitrate
Colina	Low nitrate	7.749	2.472	0.508	75.5	-4.254	0.756	Low nitrate	8.592	4.452	0.588	90.8	-0.328	2.184	Low nitrate
Dumont	Low nitrate	19.385	0.453	0.171	128.4	-4.419	2.081	Low nitrate	22.54	0.385	0.122	146.1	-3.498	2.759	Low nitrate
Gav Peix	Low nitrate	7.338	0.264	0.043	65.4	-9.311	-0.628	Low nitrate	7.571	0.633	0.048	70.5	-8.515	-0.302	Low nitrate
Guará	Low nitrate	3.982	1.228	0.318	343.5	1.821	6.105	Low nitrate	5.302	1.117	0.374	345.5	2.100	6.221	Low nitrate
Guariba	Low nitrate	22.965	0.673	0.073	152.2	-2.905	3.086	Low nitrate	20.054	1.084	0.131	147.9	-2.774	2.918	Low nitrate
Guatapar	Low nitrate	5.705	0.44	0.27	48.3	-9.301	-1.094	Low nitrate	5.529	0.273	0.164	48.6	-9.862	-1.188	Low nitrate
Ibat	Low nitrate	4.072	1.175	0.471	39.7	-8.212	-1.080	Low nitrate	4.327	1.61	0.702	44.9	-6.701	-0.714	Low nitrate
Itirapu	Low nitrate	18.247	1.309	0.0066	182.6	-1.892	3.678	Low nitrate	17.149	1.541	0.009	181.6	-1.756	3.668	Low nitrate
Jaborandi	Low nitrate	12.228	2.707	0.409	147.7	-0.909	2.994	Low nitrate	11.103	2.887	0.441	151	-0.631	3.057	Low nitrate
Jeriquara	Low nitrate	15.102	0.854	0.178	102.7	-5.410	1.274	Low nitrate	14.667	0.907	0.22	104	-5.248	1.291	Low nitrate
L Antnio	Low nitrate	3.371	0.72	1.177	32.6	-7.381	-1.531	Low nitrate	4.624	0.664	0.959	38.8	-7.621	-1.299	Low nitrate
Monte Alto	Low nitrate	21.02	1.629	0.024	174.9	-1.132	3.916	Low nitrate	19.66	1.096	0.023	177.6	-2.099	3.586	Low nitrate
N Europa	Low nitrate	4.12	0.138	0.002	51.5	-10.652	-1.320	Low nitrate	3.893	0.182	0.0004	53.3	-10.567	-1.277	Low nitrate
Nuporanga	Low nitrate	7.782	0.479	0.337	84.1	-7.475	-0.034	Low nitrate	11.157	1.049	0.93	114.8	-3.369	1.297	Low nitrate
Pontal	Low nitrate	28.814	1.569	0.688	173.1	1.859	4.580	Low nitrate	27.652	4.21	1.263	183.5	7.611	6.041	High nitrate
Pradpolis	Low nitrate	4.083	0.857	0.018	36.6	-10.020	-1.317	Low nitrate	4.535	0.99	0.026	42.5	-9.513	-1.069	Low nitrate
Rib Corr	Low nitrate	10.821	1.062	0.056	91.3	-6.556	0.707	Low nitrate	10.249	1.357	0.103	101.7	-5.722	1.046	Low nitrate
Rib Preto	Low nitrate	7.004	2.01	0.329	62.4	-6.022	0.144	Low nitrate	7.75	2.571	0.681	71	-3.791	0.701	Low nitrate
Rifaina	Low nitrate	17.355	1.995	1.517	122.9	1.020	2.547	Low nitrate	20.317	2.371	1.188	142.7	1.909	3.475	Low nitrate
Rinco	Low nitrate	12.592	0.203	0.126	83.3	-7.652	0.256	Low nitrate	12.859	0.746	0.437	89.1	-5.738	0.693	Low nitrate
Sales Oliv	Low nitrate	18.949	1.536	0.106	129	-2.985	2.593	Low nitrate	19.673	0.775	0.152	135.8	-3.672	2.443	Low nitrate
Sta Cr Esp	Low nitrate	8.381	1.365	0.031	168.4	-3.951	2.449	Low nitrate	10.265	1.749	0.035	164.7	-3.147	2.729	Low nitrate
Sta Lcia	Low nitrate	12.12	0.303	0.061	80.4	-7.854	0.193	Low nitrate	13.766	0.248	0.071	93.2	-7.187	0.621	Low nitrate
Sto Ant Al	Low nitrate	13.723	0.807	0.365	97.1	-5.413	0.992	Low nitrate	16.597	0.328	0.298	114	-5.249	1.420	Low nitrate
Serrana	Low nitrate	7.391	1.316	0.773	59	-5.945	-0.240	Low nitrate	7.709	2.022	1.429	69.6	-2.682	0.400	Low nitrate
Sertoz	Low nitrate	24.651	1.873	0.043	179.1	0.072	4.476	Low nitrate	25.574	1.569	0.069	182.8	-0.038	4.498	Low nitrate
Tabatinga	Low nitrate	26.736	0.265	0.117	166.8	-2.255	3.580	Low nitrate	25.055	0.551	0.242	174.6	-1.508	3.751	Low nitrate

TEST 1 (confusion matrix)

	High nitrate	Low nitrate
High nitrate	16	0
Low nitrate	0	34

$$\text{LDF (high nitrate)} = -13.349 + 0.175 \cdot \text{Hardness} + 1.536 \cdot \text{Cl} + 2.684 \cdot \text{N-NO}_3 + 0.034 \cdot \text{Cond}$$

$$\text{LDF (low nitrate)} = -2.990 + 0.093 \cdot \text{Hardness} + 0.499 \cdot \text{Cl} + 0.013 \cdot \text{N-NO}_3 + 0.024 \cdot \text{Cond}$$

Table SM 13 – Nitrate data analysis comparison: multivariate *versus* univariate.

Multivariate			Univariate	
Descending order	City	LDF score* (2019-2020)	City	Nitrate concentration (mg L ⁻¹ , 2019-2020)
1	Severínia	29.467	Severínia	5.517
2	Monte Azul Paulista	22.532	Trabiju	4.388
3	Terra Roxa	21.355	Terra Roxa	3.876
4	Vista Alegre do Alto	20.815	Altair	3.579
5	Altair	14.495	Monte Azul Paulista	3.549
6	Cajobi	10.646	Vista Alegre do Alto	3.25
7	Trabiju	10.076	Taiacu	2.859
8	Taiacu	9.831	Dobrada	2.716
9	Taquaral	9.808	Taquaral	2.448
10	Dobrada	9.025	Cajobi	2.311
11	Cândido Rodrigues	8.419	Igarapava	2.217
12	Igarapava	7.748	Miguelópolis	2.049
13	Pontal	7.611	Santa Ernestina	2.012
14	Miguelópolis	6.821	Aramina	1.439
15	Matão	5.057	Serrana	1.429
16	Santa Ernestina	4.971	Taiuva	1.341
17	Taiuva	4.944	Cândido Rodrigues	1.305
18	Dourado	3.358	Pontal	1.263
19	Guará	2.1	Rifaina	1.188
20	Rifaina	1.909	Barrinha	1.04
21	Barrinha	1.314	Luiz Antônio	0.959
22	Sertãozinho	-0.038	Nuporanga	0.93
23	Colina	-0.328	Matão	0.828
24	Jaborandi	-0.631	Dourado	0.801

*Second model: “hardness”, chloride, N-nitrate, conductivity

[illegible]

Figure SM 02 – State of São Paulo (Brazil): rivers and streams (available from http://www.igc.sp.gov.br/produtos/rede_hidrografica.html).



Figure SM 03 – Some scatter plots involving the chlorite variable (*Origin*® 9.1Pro).

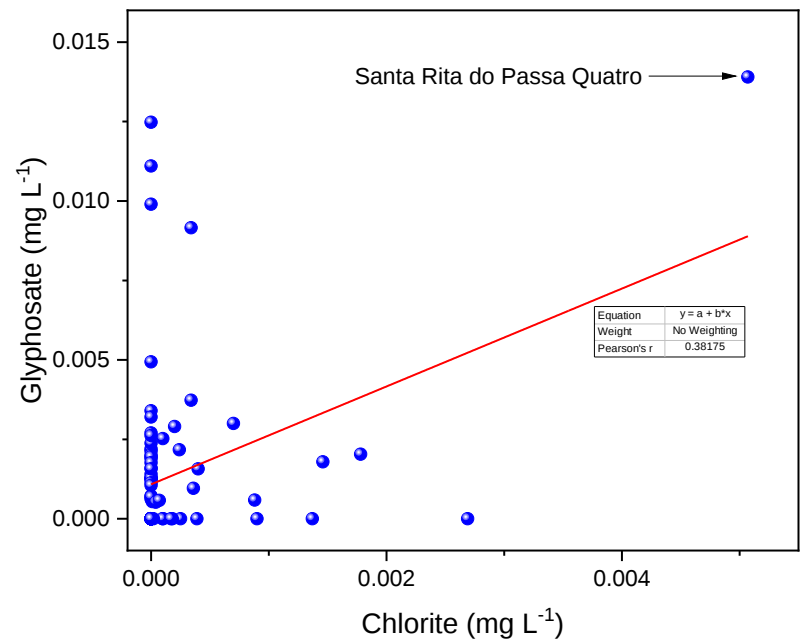
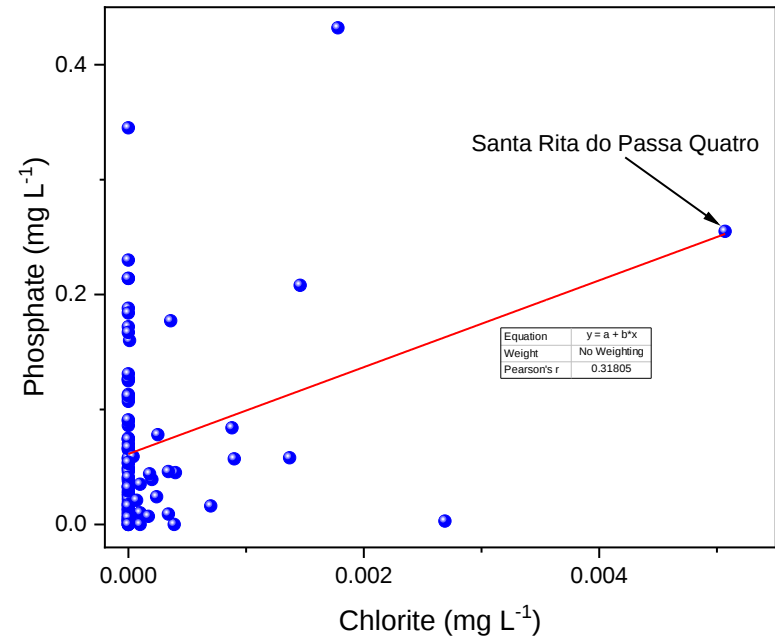
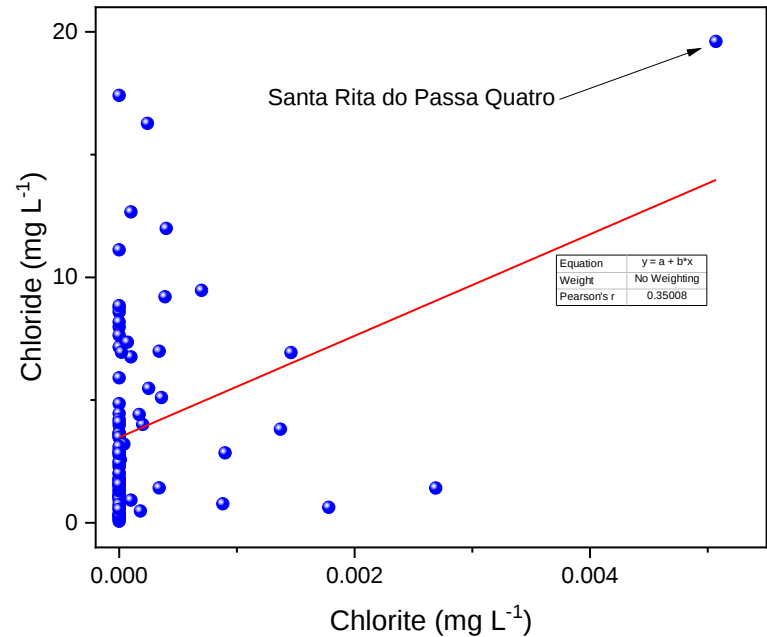


Figure SM 04 – Principal Component Analysis of 89 water samples (cities) / 12 physicochemical variables (*The Unscrambler®* X software version 10.3), PC1/PC2 graphs.

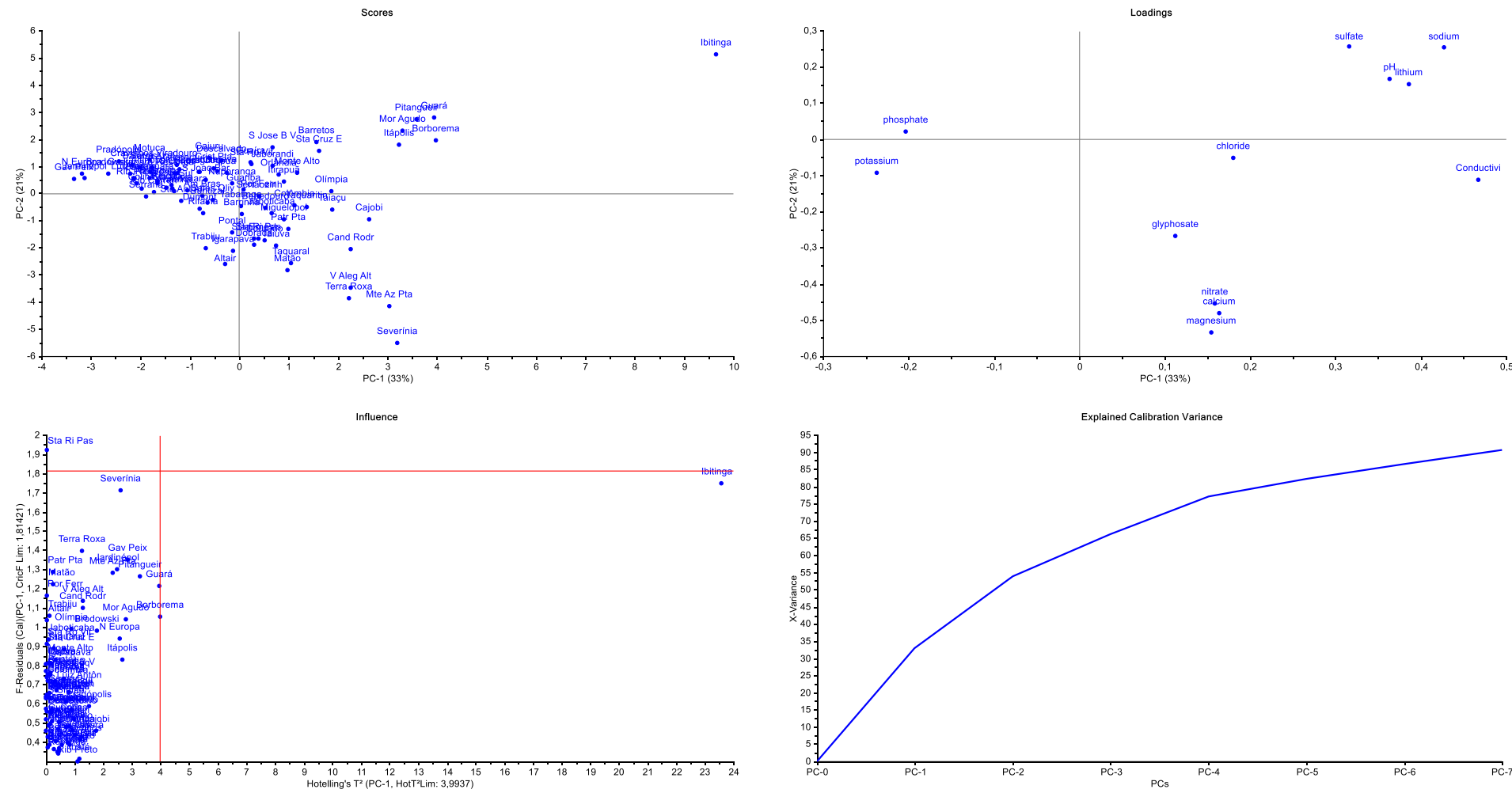


Figure SM 05 – Principal Component Analysis of 89 water samples (cities) / 12 physicochemical variables (*The Unscrambler®* X software version 10.3), PC1/PC3 graphs.

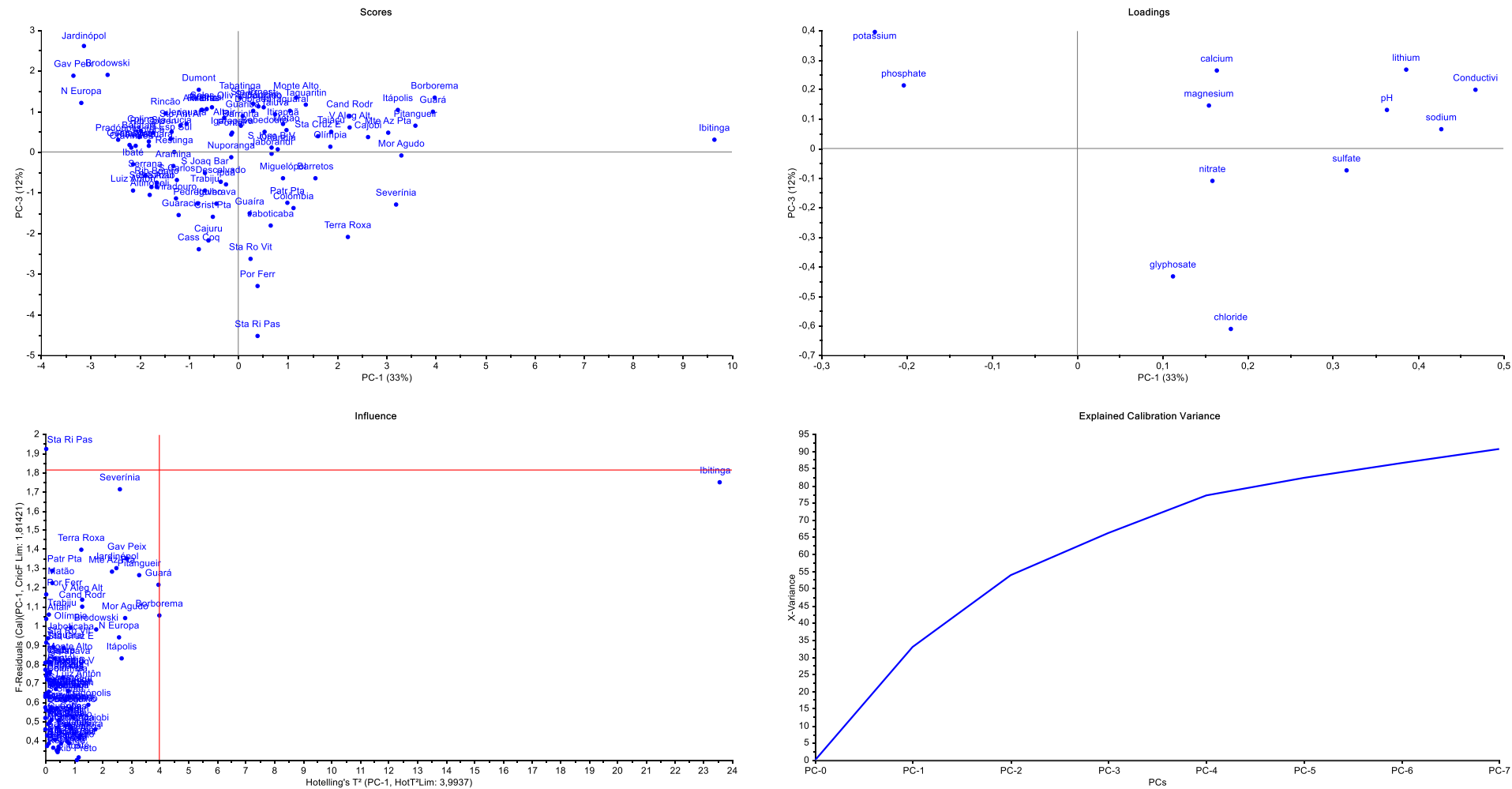


Figure SM 07 – Principal Component Analysis of 10 surface water samples (cities) / 10 physicochemical variables (*The Unscrambler® X* software version 10.3), PC1/PC2 graphs.

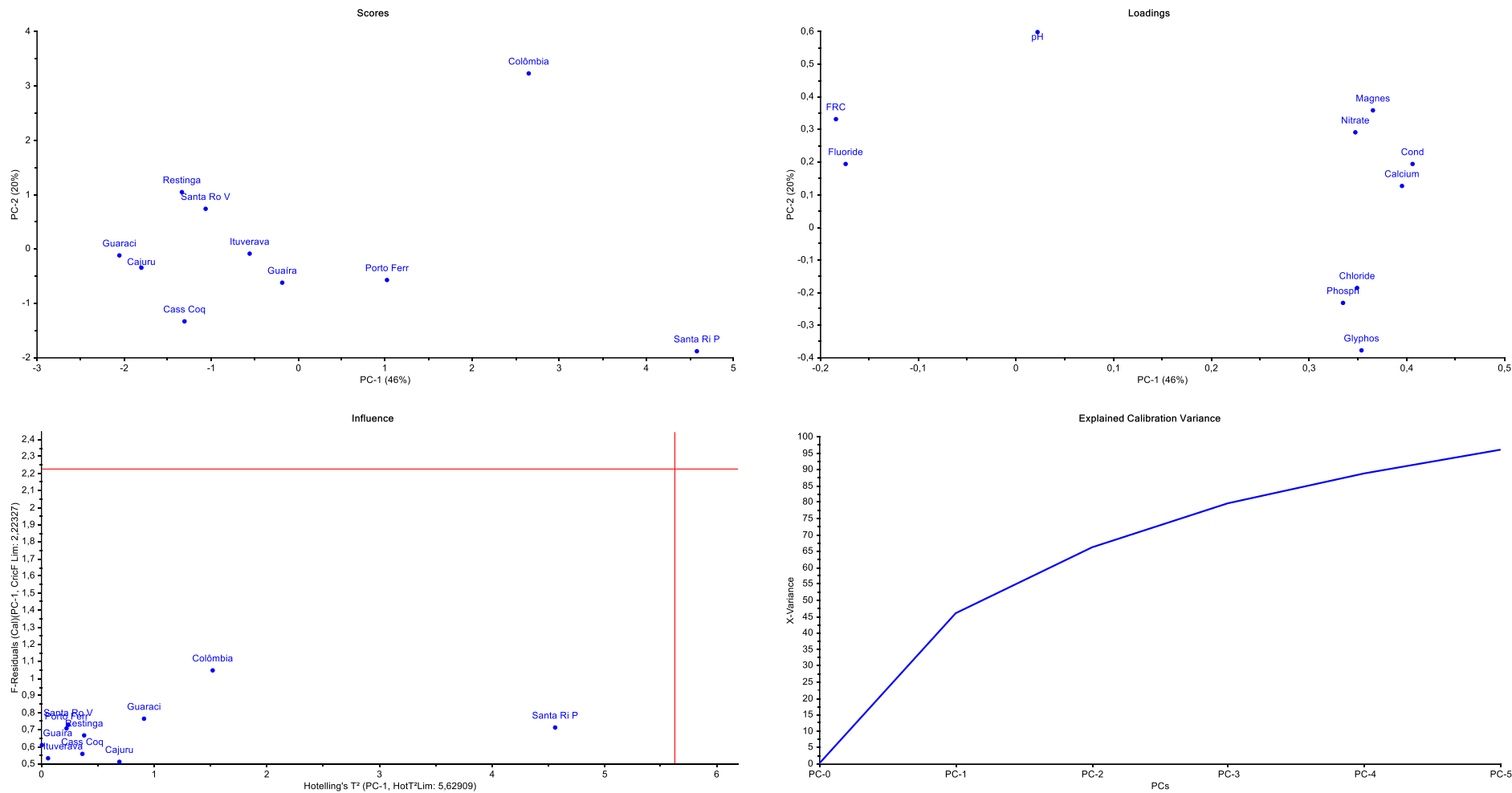


Figure SM 08 – Principal Component Analysis of 51 groundwater samples (cities) / 6 physicochemical variables (*The Unscrambler® X* software version 10.3), PC1/PC2 graphs.

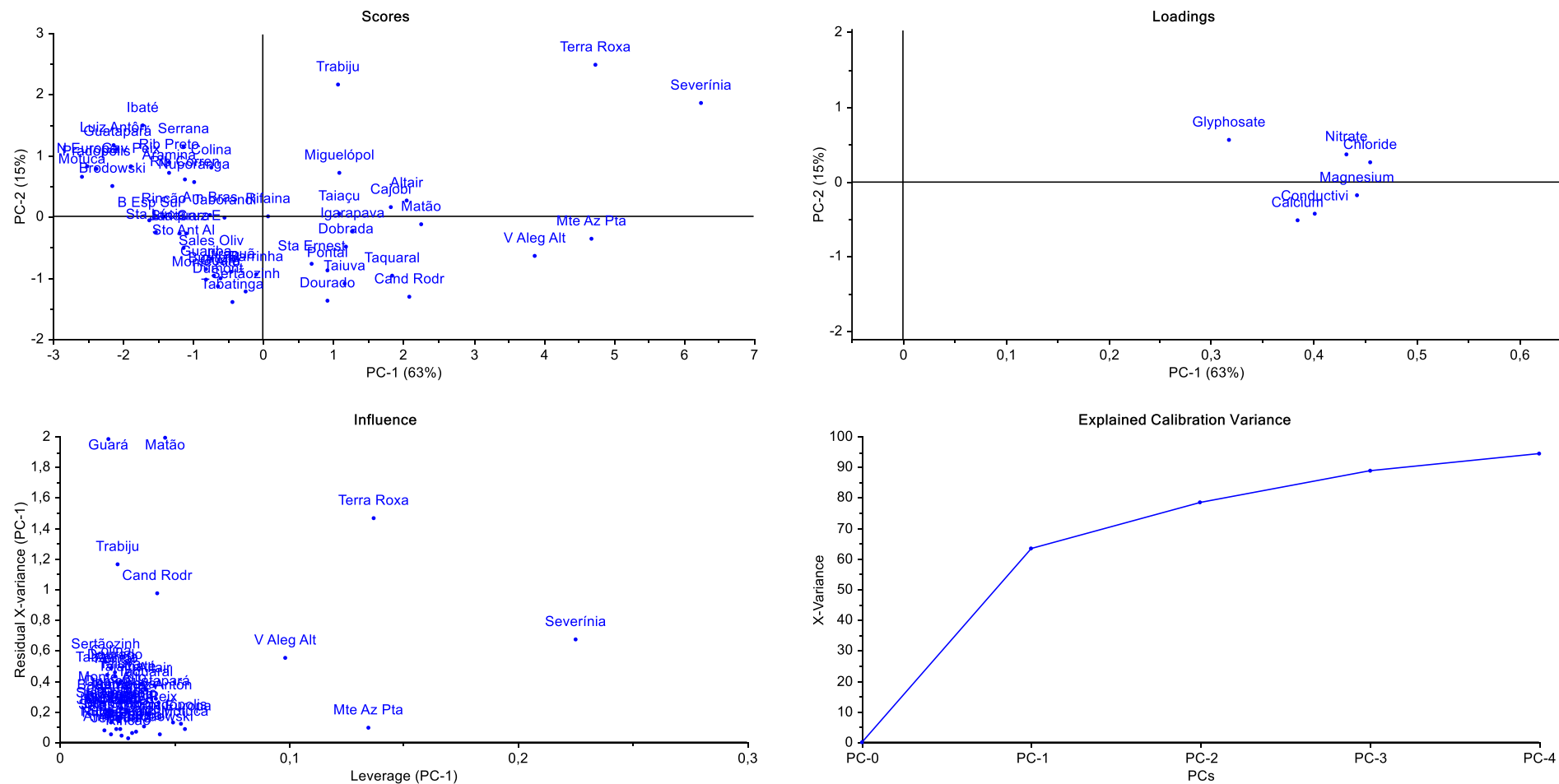


Figure SM 09 – Principal Component Analysis of 10 surface water samples (cities) / 9 physicochemical variables (*The Unscrambler® X* software version 10.3), PC1/PC2 graphs.

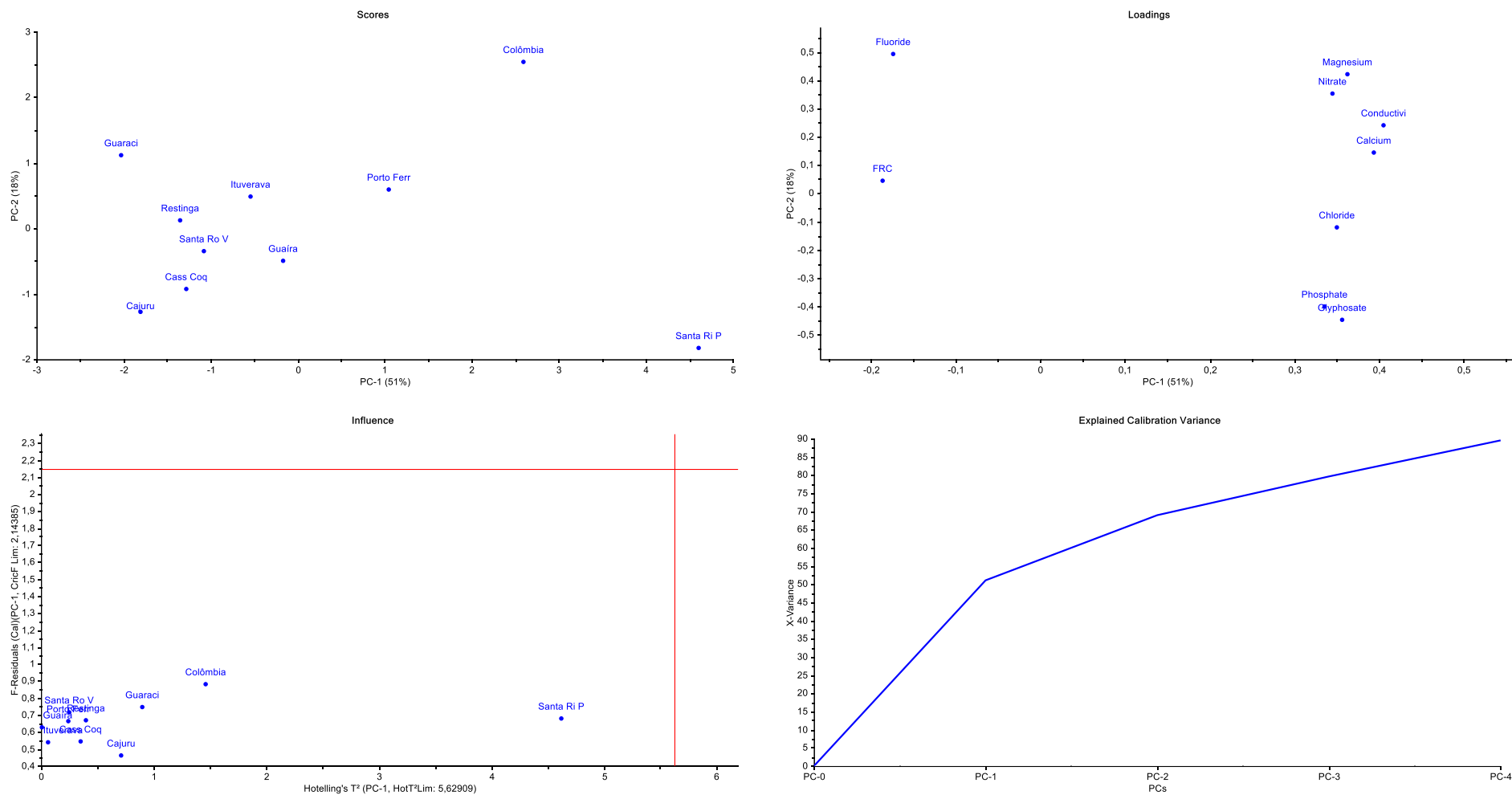


Figure SM 10 – Principal Component Analysis of 51 groundwater samples (cities) / 6 physicochemical and 4 demographic variables (*The Unscrambler®* X software version 10.3), PC1/PC2 graphs.

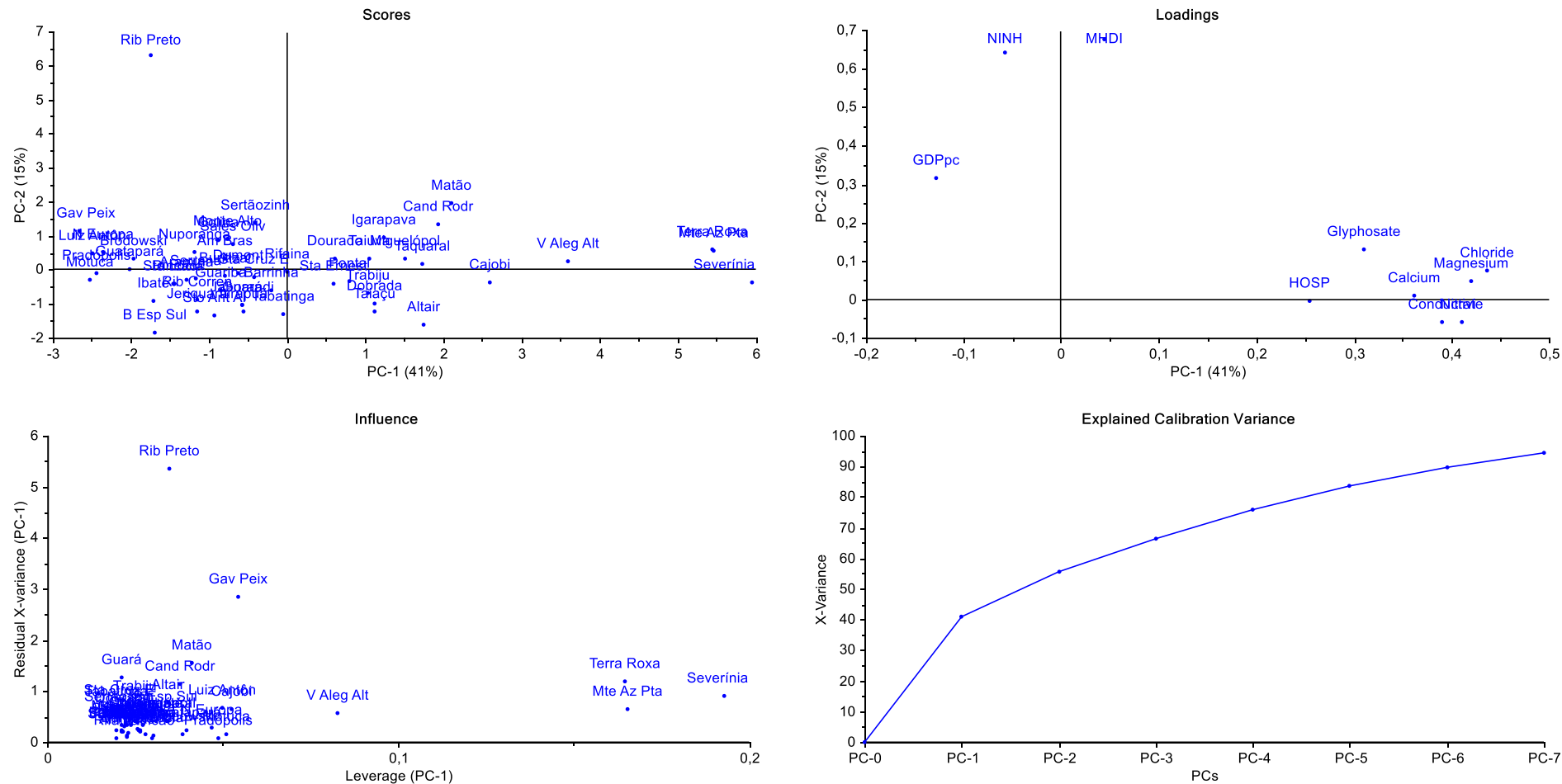


Figure SM 11 – Principal Component Analysis of 10 surface water samples (cities) / 9 physicochemical and 4 demographic variables (*The Unscrambler® X* software version 10.3), PC1/PC2 graphs.

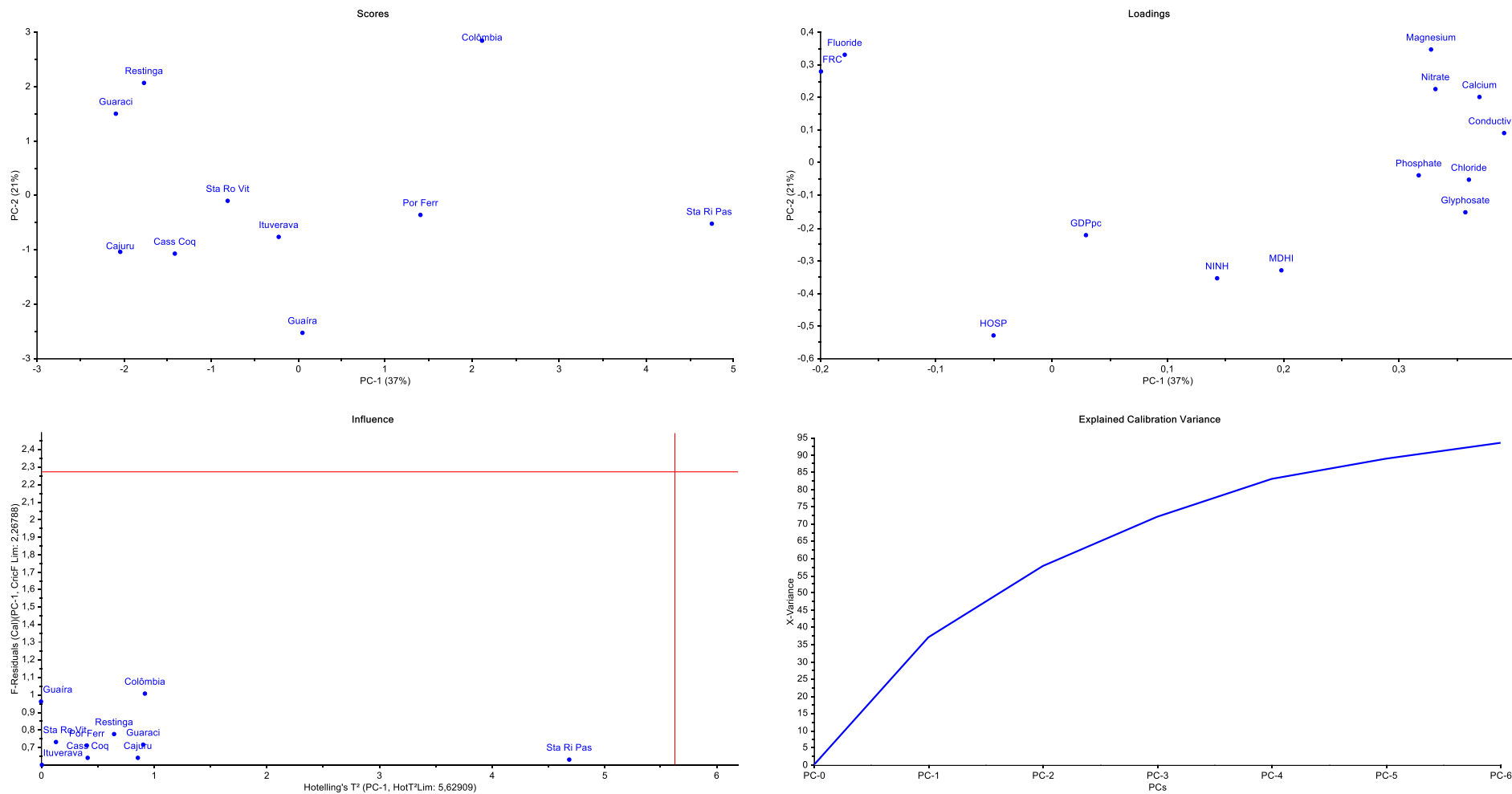


Figure SM 12 – Cluster Analysis (Ward method) of 50 groundwater samples (cities) / 5 physicochemical variables / 2015-2016 period (*The Unscrambler® X* software version 10.3).

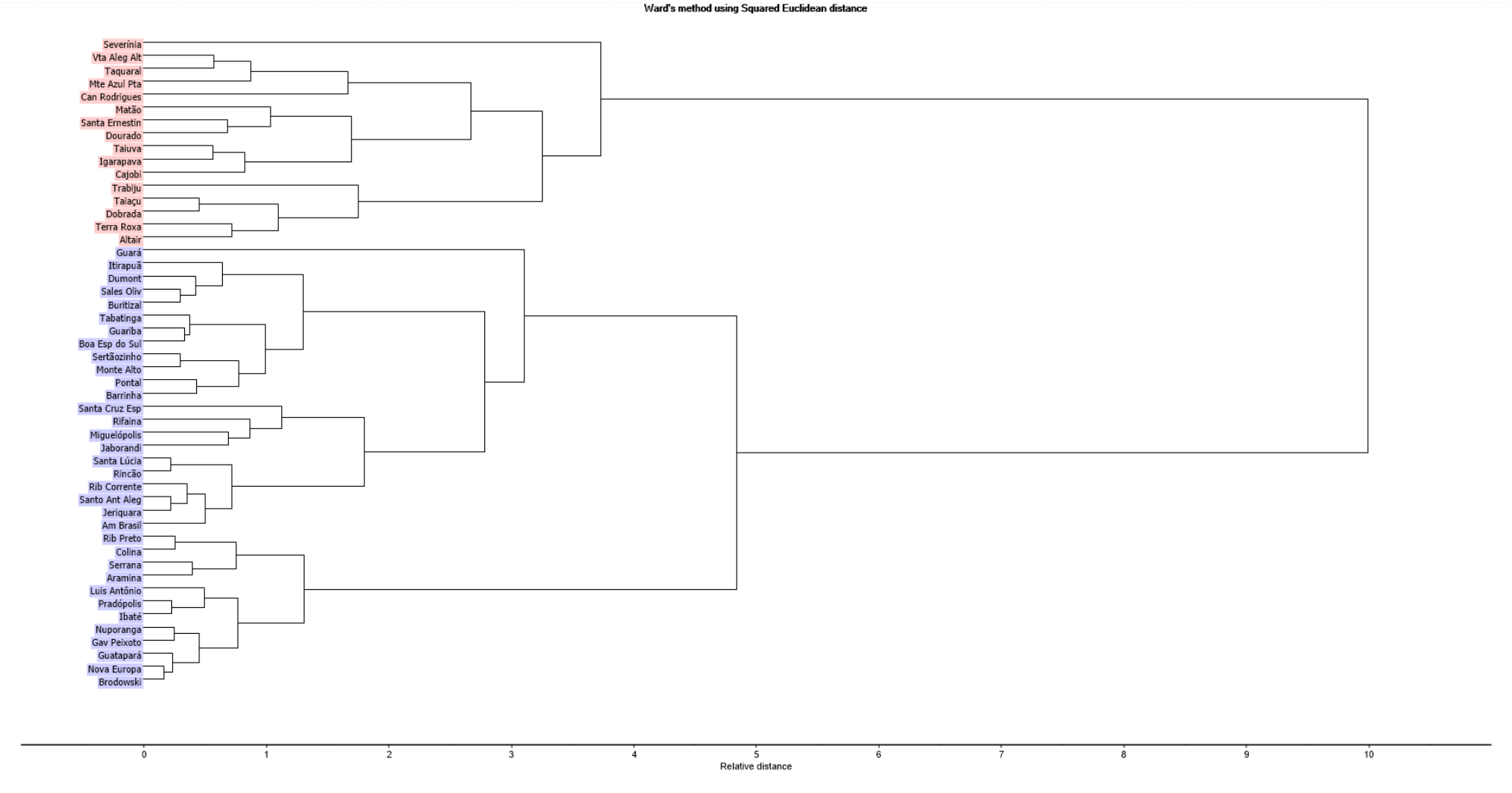


Figure SM 13 – Principal Component Analysis of 50 groundwater samples (cities) / 5 physicochemical variables / 2015-2016 period (*The Unscrambler*® X software version 10.3), PC1/PC2 graphs.

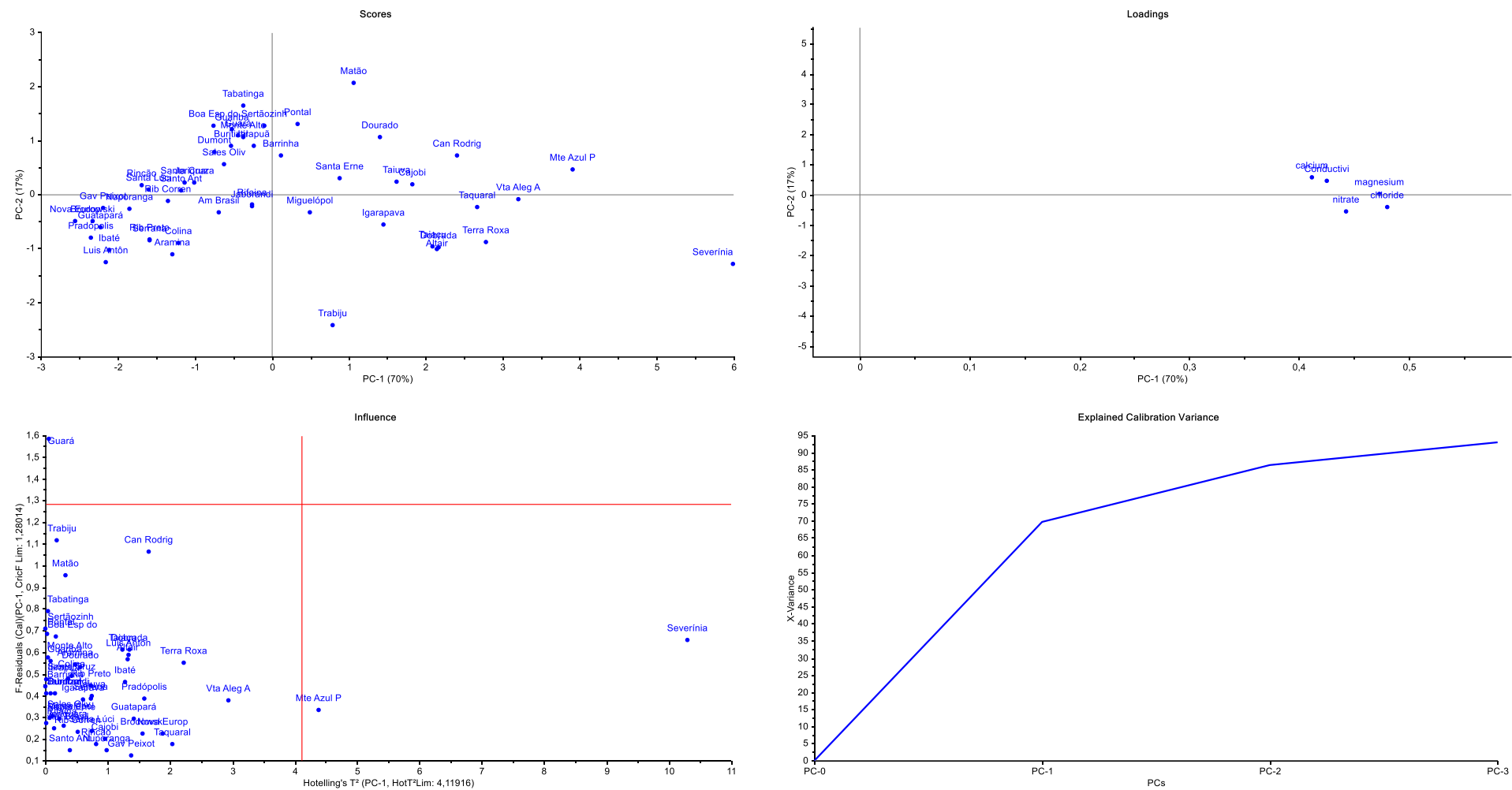


Figure SM 14 – Principal Component Analysis of 50 groundwater samples (cities) / 5 physicochemical variables / 2019-2020 period (*The Unscrambler®* X software version 10.3), PC1/PC2 graphs.

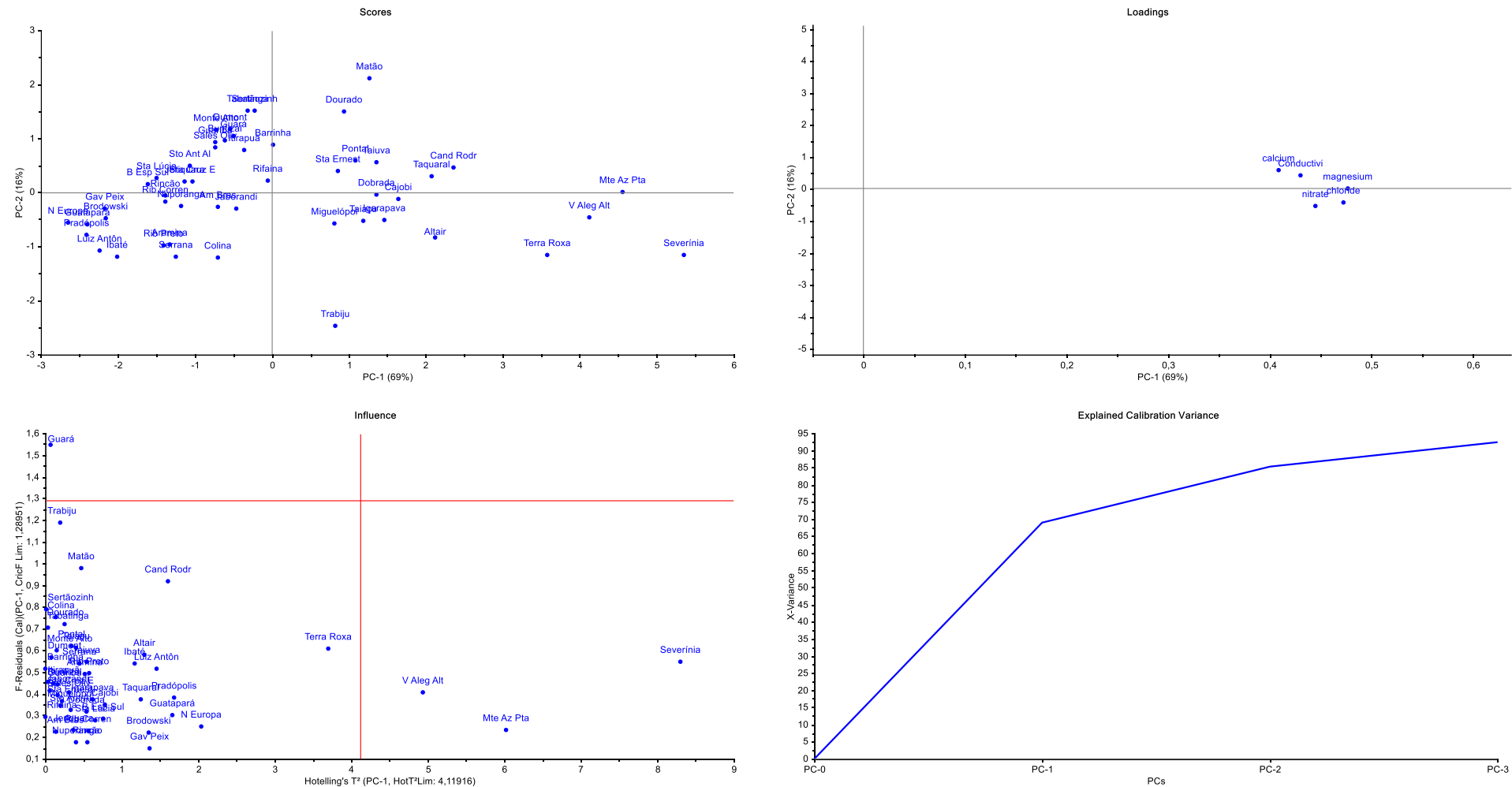


Figure SM 15 – Principal Component Analysis of 50 groundwater samples (cities) / 4 physicochemical variables (with “hardness”) / 2015-2016 period (*The Unscrambler® X* software version 10.3), PC1/PC2 graphs.

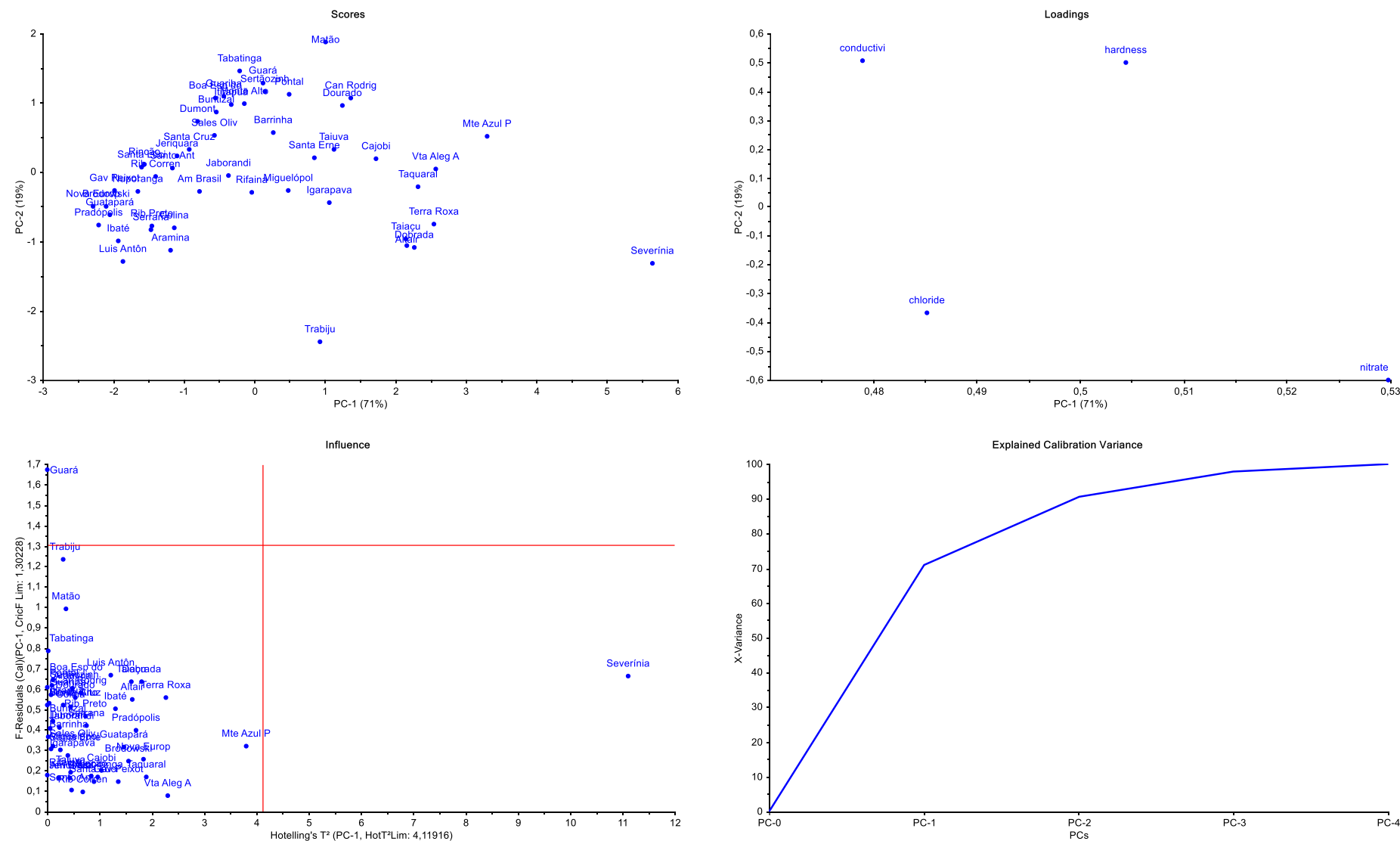


Figure SM 16 – Principal Component Analysis of 50 groundwater samples (cities) / 4 physicochemical variables (with “hardness”) / 2019-2020 period (*The Unscrambler*® X software version 10.3), PC1/PC2 graphs.

