

Table 1. Locations of the sampling sites of our field work on the Tibetan Plateau.

No.	Lake	Latitude (°N)	Longitude (°E)	Elevation (m a.s.l.)	Water area (km ²)	Vegetation type
1	Cuomujiri	94.4304	29.8118	4235	1.64 ^a	Forest
2	Ranwu Lake	96.8252	29.3962	5263	13.58 ^b	Forest
3	Sanse Lake	94.7670	30.7239	4042	0.63 ^a	Forest
4	Ren Co	96.6748	30.7156	4452	3.55 ^b	Forest
5	Potal Lake	95.5743	31.6223	4656	8.35 ^a	Forest
6	Ruba Lake	90.1725	29.4644	3923	0.67 ^b	Meadow
7	Namucoluo	90.3347	29.6070	4690	0.36 ^a	Meadow
8	Cuoriwang	90.4064	30.0345	4400	0.28 ^a	Meadow
9	Niangde Co	90.1834	29.2810	4365	0.27 ^a	Meadow
10	Cona Lake	91.4305	32.0779	4602	188.54 ^b	Meadow
11	Tangbin Lake	90.9672	30.4795	5025	0.72 ^a	Meadow
12	Cuoe	91.5350	31.5088	4511	86.62 ^b	Meadow
13	Changma Lake	92.1069	32.0639	4932	3.89 ^a	Meadow
14	Cuomuri	92.0596	31.6201	4547	3.65 ^a	Meadow
15	Gemu Co	91.6990	31.5550	4524	1.43 ^b	Meadow
16	Xiongmu Co	91.6303	31.0399	4662	2.35 ^a	Meadow
17	Nairi Pingco	91.4788	31.2730	4513	95.56 ^b	Meadow
18	Cuomuzhelin	88.2168	28.3933	4395	54.43 ^b	Meadow
19	Nariyong Co	91.9377	28.3071	4731	23.31 ^b	Meadow
20	Peiku Co	85.5869	28.8507	4561	272.95 ^b	Meadow
21	Zhegu Co	91.6770	28.6316	4601	59.06 ^b	Meadow
22	Nianjie Co	96.2905	33.0773	4441	20.66 ^b	Meadow
23	Samu Co	93.7813	30.9753	4748	1.64 ^a	Meadow
24	Hala Lake	97.5967	38.2507	4071	611.57 ^a	Meadow
25	Zhaling Lake	97.3420	34.9447	4280	526.62 ^b	Meadow
26	Koucha Lake	97.2311	34.0081	4518	18.16 ^b	Meadow
27	Eling Lake	97.7130	35.0217	4257	629.75	Meadow
28	Goulu Co	92.4546	34.5942	4639	25.89 ^a	Steppe
29	UlanUl Lake	90.7108	34.8528	4857	566.96 ^b	Steppe
30	Xijir Ulan Lake	90.3528	35.1875	4769	373.87 ^b	Steppe
31	Lexiewudan Lake	90.2053	35.7071	4862	247.58 ^b	Steppe
32	Xiangyang Lake	89.4616	35.8194	4843	3.67 ^b	Steppe
33	Kekexili Lake	91.2205	35.6115	4875	315.95 ^b	Steppe
34	Kekao Lake	91.3874	35.6973	4881	60.04 ^b	Steppe
35	Zhuonai Lake	91.9833	35.5325	4734	255.37 ^a	Steppe
36	Kusai Lake	92.9412	35.6753	4471	271.08 ^b	Steppe
37	Zigētang Co	90.8973	32.0674	4538	225.55 ^b	Steppe
38	Daru Co	90.7324	31.6562	4675	134.27 ^b	Steppe
39	Bange Lake	89.4734	31.7282	4519	136.34 ^b	Steppe
40	Lingge Co	88.7220	33.9370	5061	108.14 ^b	Steppe
41	Qiangang Co	88.3966	33.2313	4719	21.64 ^a	Steppe
42	Caiduochaka Lake	88.9793	33.1576	4833	37.14 ^b	Steppe

43	Eya Co	88.6713	33.0013	4824	75.14 ^b	Steppe
44	Ri Co	89.6068	30.9302	4648	113.02 ^a	Steppe
45	Mujiu Co	89.0144	31.0337	4664	83.58 ^b	Steppe
46	Suo Co	90.9056	31.3978	4556	0.16 ^a	Steppe
47	Mading Co	90.2995	31.4147	4680	0.16 ^a	Steppe
48	Maiding Co	90.3202	31.8413	4773	0.35	Steppe
49	Changma Co	87.8756	32.2605	4725	4.43 ^b	Steppe
50	Cuolongjiao	88.8539	32.7857	4873	3.55 ^b	Steppe
51	Duomaxiang Lake	89.1268	32.3249	4704	0.07 ^a	Steppe
52	Gewa Co	88.7968	30.6725	4745	1.86 ^a	Steppe
53	Wojiong Co	89.3646	31.6276	4598	0.01 ^a	Steppe
54	Gaa Co	88.9583	32.2130	4602	10.28 ^b	Steppe
55	Chelachapuka	86.1548	31.8024	4773	0.37 ^a	Steppe
56	Yong Co	84.7044	31.9383	4712	2.09 ^b	Steppe
57	Rena Co	84.2559	32.7281	4579	19.49 ^b	Steppe
58	Chabo Co	84.2108	33.3512	4500	40.89 ^b	Steppe
59	Jibuchaga Co	83.9975	32.0205	4467	8.17 ^a	Steppe
60	Cuoguo Co	83.2921	32.2503	4669	10.07 ^a	Steppe
61	Bieruoze Co	82.9417	32.4308	4392	32.27 ^b	Steppe
62	Shekazhi	82.0466	32.0115	4591	17.78 ^a	Steppe
63	Dagze Co	87.4456	31.8332	4465	269.07 ^b	Steppe
64	Xiabie Co	87.2680	32.2179	4592	17.85 ^b	Steppe
65	Jiaruo Co	86.6001	32.1730	4445	13.34 ^b	Steppe
66	Xuguo Co	90.3251	31.9542	4598	33.12 ^b	Steppe
67	Beilei Co	88.4296	32.9120	4797	25.23 ^b	Steppe
68	Unknown	81.7962	31.1937	5433	0.50 ^a	Steppe
69	Nading Co	85.4359	32.6776	4845	12.43 ^a	Steppe
70	Bala Co	82.9849	33.4281	4757	1.53 ^a	Steppe
71	Dong Co	84.7120	32.1440	4388	92.47 ^b	Steppe
72	Xiaogemu Co	85.7384	33.5778	4711	0.04 ^a	Steppe
73	Ningri Co	85.6752	33.3333	5020	21.02 ^b	Steppe
74	Guping Lake	85.6787	33.1683	5030	2.22 ^b	Steppe
75	Qiuruba Co	84.7966	33.3073	4733	9.02 ^b	Steppe
76	Caima'er Co	84.5879	33.5469	4573	45.12 ^b	Steppe
77	Selin Co	88.6979	31.7363	4512	2129.02 ^b	Steppe
78	Zhari Namco	85.4004	30.9068	4595	990.26 ^b	Steppe
79	Kuhai Lake	99.1636	35.3070	4117	48.50 ^b	Steppe
80	Donggi Cona	98.6596	35.2875	4066	238.15 ^a	Steppe
81	Aru Co	82.4768	33.9682	4904	91.22 ^a	Desert
82	Aksai Chin Lake	79.7863	35.2456	4831	170.22 ^a	Desert
83	Kunchuke Co	82.6590	33.7096	5042	22.90 ^b	Desert
84	Xiawei Lake	82.0454	34.6738	5110	5.52 ^b	Desert
85	Luotuo Lake	81.9849	34.4339	5082	63.43 ^b	Desert
86	Meima Co	82.4404	34.1278	4897	145.22 ^b	Desert

87	Lhanag Co	81.2820	30.6674	4577	270.32 ^a	Desert
88	Hongshan Lake	80.0545	34.8300	5043	6.35 ^b	Desert
89	Manasarovar Lake	81.3939	30.7465	4577	409.90 ^b	Desert
90	Xiada Co	79.3584	33.3916	4338	8.04 ^a	Desert

^a: data measured from ArcGis; ^b data from Yang, 2019.

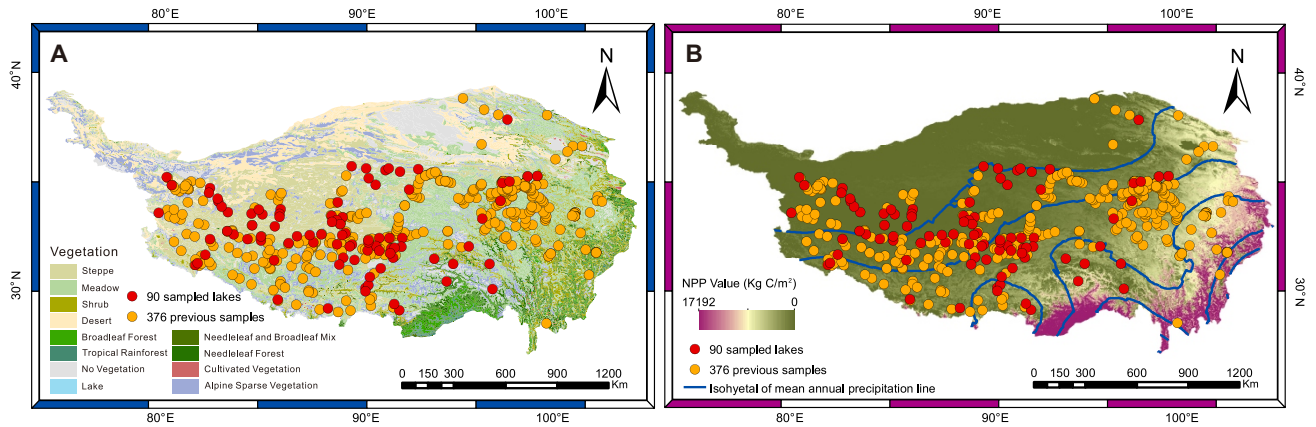


Figure 1. Spatial distribution of 476 modern pollen samples collected from lake surface-sediments on the Tibetan Plateau (red filled circles: 90 sampled lakes; orange filled circles: 386 previous samples, Herzsuh et al., 2010; Li and Li, 2015; Cao et al., 2021; Ma et al., 2024; Wu et al., 2024) based on (A) vegetation types and (B) net primary production (NPP, Zhao and Running, 2010).

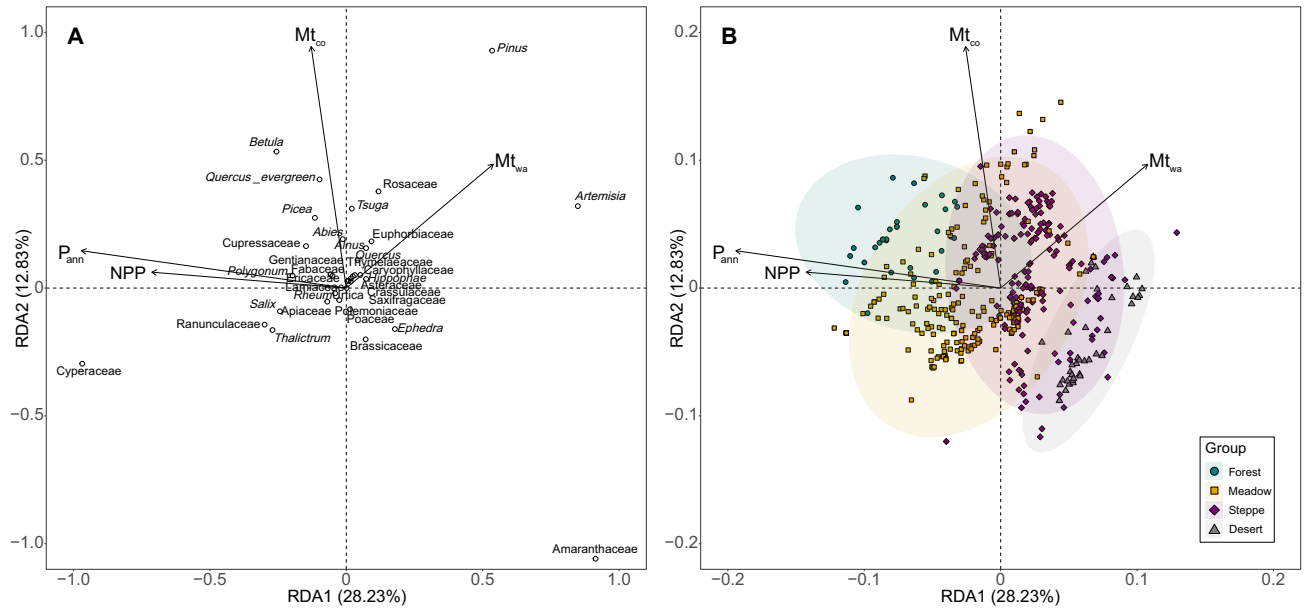


Figure 5. Redundancy analysis (RDA) biplots of the pollen dataset along the first two axes, showing the relationships between (A) 35 selected pollen taxa (circles) and (B) 476 integrated samples (symbols) from different vegetation types and the four variables respectively (arrows): net primary production (NPP, Kg C m^{-2}), mean annual precipitation (P_{ann} , mm), mean temperature of the coldest month (Mt_{co} , $^{\circ}\text{C}$), and mean temperature of the warmest month (Mt_{wa} , $^{\circ}\text{C}$).