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A high-altitude peatland record of environmental changes in the NW Argentine Andes (24° S) over the last 2100 years

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Supplementary Material

Principal component analysis of the geochemical data

The PCA of the inorganic and organic geochemical variables shows that component 1 explains 38.9% of the total variance, whereas component 2 explains an additional 18.3% (Fig. S1). Ti/coh contributes negatively to component 1, while mainly Fe/Ti, Mn/Ti, TN and TOC* are at the opposite. Component 2 is mainly characterised by Mn/Fe, Ca/Ti, $\delta^{13}C$ and $\delta^{15}N$ at the positive end opposite to TOC*/TN.

The PCA plot clearly illustrates that Fe/Ti is tied opposite to Ti/coh. Ti is of lithogenic origin and brought to the peatland by run-off, where it is incorporated as particulate sediment (Margalef et al., 2013). Ti/coh, therefore, is an indicator for episodic allochthonous sediment input due to enhanced rainfall. Here, the amplitude of input is controlled by the erodibility of the water catchment area (Schittek et al., 2012), and not necessarily acts as a measure for the amount and duration of precipitation.

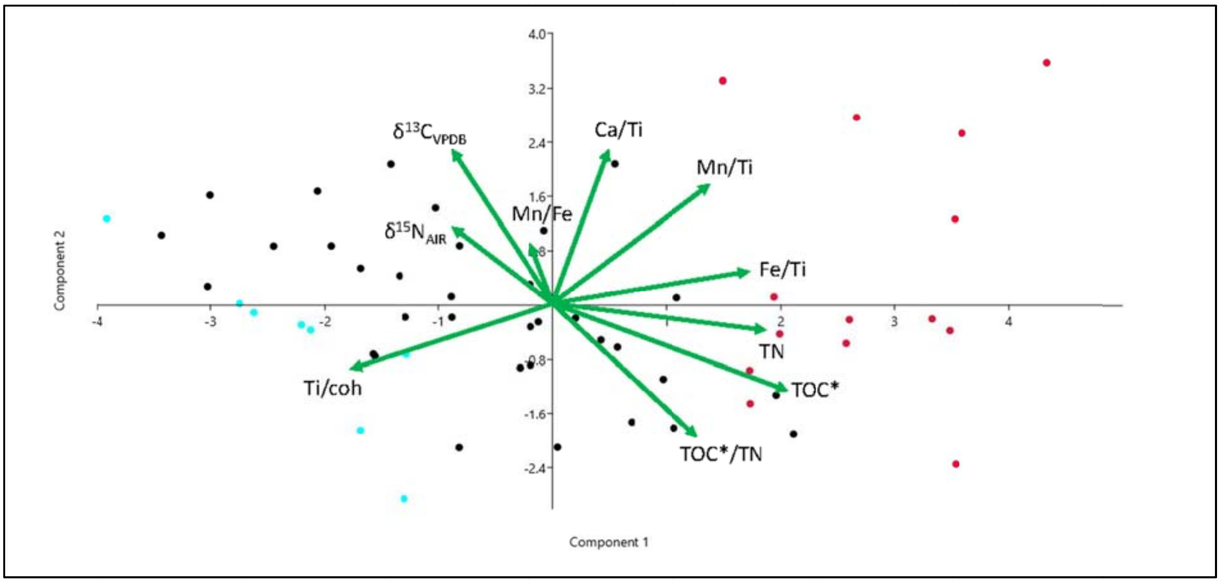

Figure S1: Principal component analysis of the geochemical data. Component 1 explains 38.9% of the total variance and component 2 explains additional 18.3%. Red dots: peak values of Fe/Ti (values >85). Blue dots: peak values of Ti/coh (values >0.05).

Table S1: Loadings of the PCA.

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9	PC 10	PC 11
Ti/coh	-0.41	-0.21	0.02	0.10	-0.23	0.14	-0.13	0.78	-0.12	0.27	-0.01
Ca/Ti	0.11	0.49	-0.2	-0.26	0.57	-0.11	-0.42	0.35	0.08	0.04	-0.01
As/Ti	0.43	0.19	-0.05	-0.01	-0.14	-0.25	0.19	0.02	-0.59	0.56	0.01
Fe/Ti	0.34	0.11	-0.43	0.06	-0.42	-0.05	0.09	0.14	0.66	0.19	-0.01
Mn/Ti	0.3	0.34	0.35	-0.01	-0.44	-0.07	-0.10	0.29	-0.15	-0.59	-0.01
Mn/Fe	-0.03	0.19	0.75	-0.1	-0.06	0.02	-0.15	-0.13	0.37	0.46	0.01
C (%)	0.41	-0.24	0.15	0.15	0.26	0.27	0.1	0.17	0.05	-0.01	-0.74
N (%)	0.36	-0.04	0.04	0.48	0.16	0.52	-0.2	0.03	-0.04	0.04	0.54
C/N	0.26	-0.39	0.21	-0.38	0.26	-0.21	0.43	0.32	0.15	-0.1	0.4
$\delta^{13}C$	-0.19	0.49	-0.03	-0.18	0.05	0.55	0.62	0.07	-0.01	0.001	0.004
$\delta^{15}N$	-0.17	0.24	0.12	0.69	0.25	-0.45	0.34	0.13	0.13	-0.05	0.001

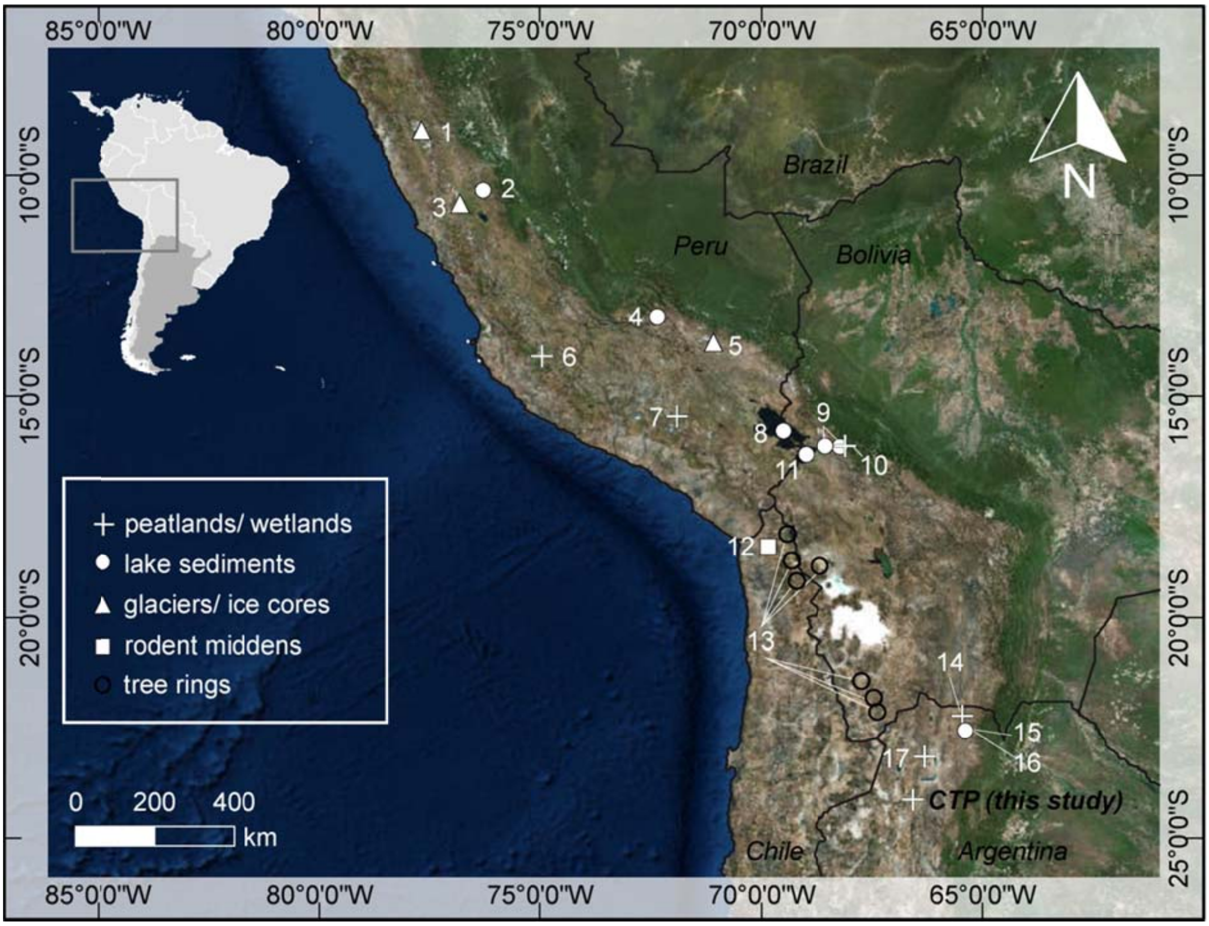

Figure S2: Map of the Central Andes (12°-25° S) with the records that are compared to the CTP in the text (data source: World Imagery and Natural Earth data). Symbols were used to differentiate between climate archives (plus sign: peatlands, white circle: lakes, triangle: glaciers or ice cores, quadrat: rodent middens, black circle: tree rings). The numbers reflect the associated authors which can be found in Table S2.

Table S1: Geographical position, site name, type of archive, authors and associated numbers of discussed paper illustrated in Fig. S2.

number	site	archive	authors	latitude	longitude
1	Huascarán	ice core	Thompson et al., 1995	09°06' S	77°36' W
2	Pumacocha	lake	Bird et al., 2011	10°23' S	76°05' W
3	Cerros Cuchpanga	moraines	Wright 1984	10°45' S	76°35' W
4	Marcacocha	(infilled) lake	Chepstow-Lusty et al., 2003	13°13' S	72°12' W
5	Quellcaya/ Qori Kalis	ice core & moraines	Stroup et al., 2014	13°55' S	70°49' W
6	Cerro Llamoca	peatland	Schittek et al. 2015	14°10' S	74°44' W
7	Carhuasanta valley	peatland	Engel et al., 2014	15°29' S	71°42' W
8	Lago Titicaca	lake	Baker et al., 2001	15°51' S	69°23' W
9	Lago Taypi Chaka Kkota	lake	Abbott et al., 1997	16°13' S	68°20' W
9	Laguna Viscachani	lake	Abbott et al., 1997	16°11' S	68°06' W
10	Tiquimani	wetland	Ledru et al., 2013	16°12' S	68°03' W
11	Lago Wiñaymarka	lake	Binford et al., 1997	16°15' S	68°42' W
12	Quebrada La Higuera	rodent middens	Mujica et al., 2015	18°26' S	69°43' W
13	Volcán Guallatiri	tree ring	Morales et al., 2012	18°28' S	69°04' W
13	Salar de Surire	tree ring	Morales et al., 2012	18°56' S	69°00' W
13	Frente Sabaya	tree ring	Morales et al., 2012	19°06' S	68°27' W
13	Queñiza	tree ring	Morales et al., 2012	19°22' S	68°55' W
13	Volcán Caquella	tree ring	Morales et al., 2012	21°30' S	67°34' W
13	Soniqueira	tree ring	Morales et al., 2012	22°00' S	67°17' W
13	Volcán Uturuncu	tree ring	Morales et al., 2012	22°32' S	66°35' W
14	Lizoite	peatland	Schittek 2014	22°13’ S	65°14’ W
15	Sierra de Santa Victoria	peatland & moraines	Zipprich et al., 2000	22°20' S	65°13' W
16	Sierra de Santa Victoria	lake	Schäbitz et al., 2001	22°20' S	65°13' W
17	Sierra de Aguilar	peatland	Markgraf, 1985	23°10' S	66°05' W
-	Cerro Tuzgle	peatland	*this study*	24°09' S	66°24' W

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