

# Supporting Information

## **Giant dust particles at Nevado Illimani: a proxy of summertime deep convection over the Bolivian Altiplano**

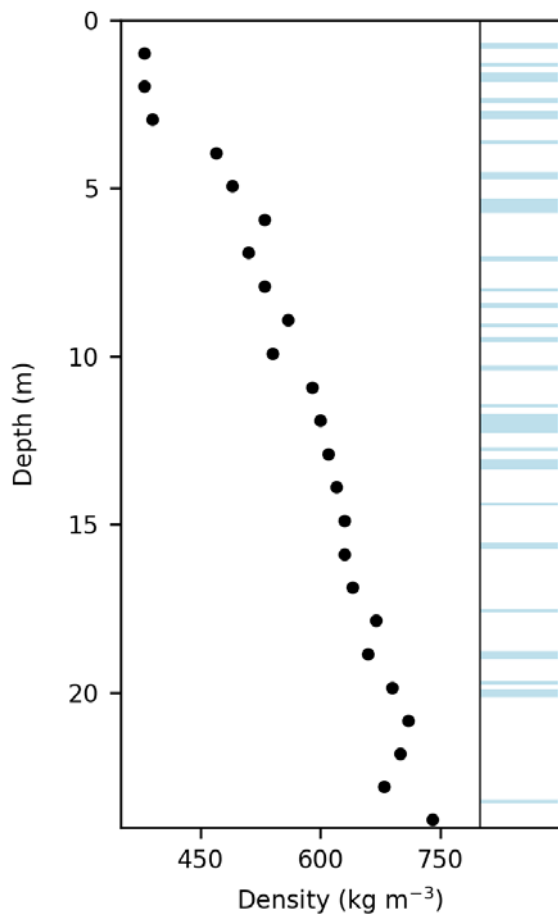
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**Figure S1: The Nevado Illimani firn core density profile. The right panel refer to depth intervals where groups of ice layers were observed.**

15 **Table S1: Sections of the Nevado Illimani firn core analysed for elemental (N1 to N10) and mineralogical (R1 to R4) composition.**

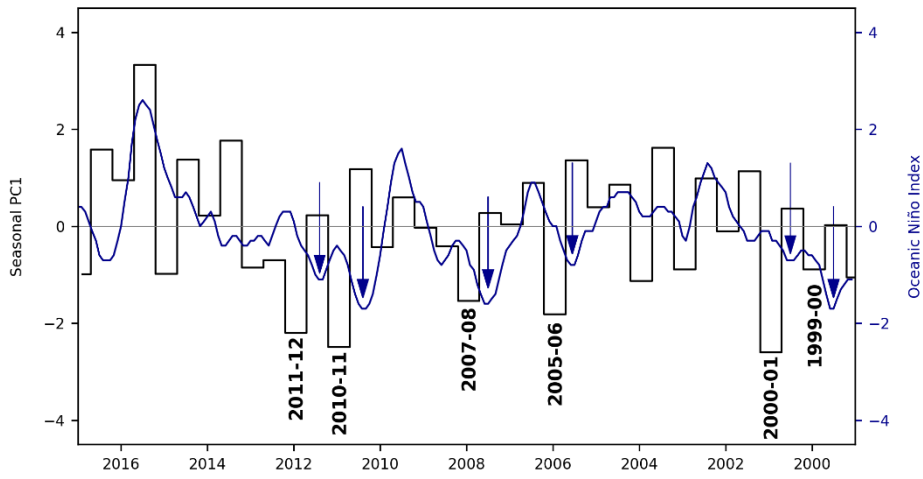
Sample	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	R1	R2	R3	R4
Top depth (m)	1.67	2.31	5.57	8.67	10.56	13.60	13.69	19.10	20.29	21.41	5.79	5.91	9.80	10.00
Bottom depth (m)	2.31	3.78	7.02	8.97	11.66	13.69	14.78	19.25	20.48	22.50	5.82	6.00	9.84	10.17

20 **Table S2: Average elemental concentrations measured by Instrumental Neutron Activation Analysis, and the procedural errors and the detection limits (DL).**

Element	Ce	Cs	Eu	Hf	La	Sc	Sm	Th	Yb
Concentration (ppm)	89.8	21.1	1.60	13.1	40.8	13.7	8.14	17.6	2.71
Error (%)	7.24	13.8	6.65	9.97	4.05	3.97	7.27	7.16	10.8
DL (ppm)	7	4	0.8	3	0.5	0.3	0.1	4	0.1

**Table S3: Mineral phases and relative abundance (number of grains, %) in Illimani firn from different time periods.**

	R1	R2	R3	R4
Year	2010	2009-10	2004-05	2004
Season	dry	wet	wet	dry
Particles analyzed	167	161	138	167
	N (%)	N (%)	N (%)	N (%)
Quartz and polymorphs	31.7	21.7	13.8	23.4
K-feldspars	7.2	10.6	5.1	11.4
Plagioclases	10.8	9.3	7.2	18.6
Muscovite-illite-smectite	23.4	29.2	59.4	19.2
Other phyllosilicates	0.6	1.2	0.0	1.2
Clay minerals (kaolinite)	0.6	1.2	0.0	3.0
Clinopyroxenes	0.0	0.6	0.0	0.0
Orthopyroxenes	0.0	0.0	0.0	0.0
Amphiboles	0.0	0.0	0.0	0.0
Rutile	2.4	2.5	0.0	0.6
Anatase	4.2	6.8	4.3	2.4
Hematite	9.0	8.7	7.2	14.4
Goethite	8.4	5.6	1.4	3.0
Carbonates	0.0	1.2	0.0	0.0
Epidotes	0.0	0.0	0.0	0.0
Titanite	0.0	0.0	0.0	0.0
Tourmaline	1.2	0.0	0.7	0.6
Other heavy minerals	0.6	1.2	0.7	1.2
Other light minerals	0.0	0.0	0.0	1.2
Total	100	100	100	100



30 **Figure S2: comparison of the seasonal PC1 of CPPms and  $\delta D$  (black line) and the Oceanic Niño Index (ONI) (blue line) typically used for identifying El Niño (warm) and La Niña (cool) events in the tropical Pacific. It is possible to note that the highest convection (low PC1) is associated to summer seasons of La Niña years.**