

Supporting Information for "Proxies for atmospheric circulation over the Amazon basin from the aerosol composition in a Nevado Illimani firn core, Bolivia"

Filipe G. L. Lindau¹, Jefferson C. Simões^{1,2}, Michael Handley², Elena

Korotkikh², Patrick Ginot³, Rafael R. Ribeiro¹

¹Centro Polar e Climático, Universidade Federal do Rio Grande do Sul, Porto Alegre, 91501-970, Brazil

²Climate Change Institute, University of Maine, Orono, ME 04469, USA

³Univ. Grenoble Alpes, CNRS, IRD, Grenoble INP, IGE, 38000 Grenoble, France

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Corresponding author: Filipe G. L. Lindau, Centro Polar e Climático, Universidade Federal do Rio Grande do Sul, Porto Alegre, 91501-970, Brazil (filipe.lindau@outlook.com)

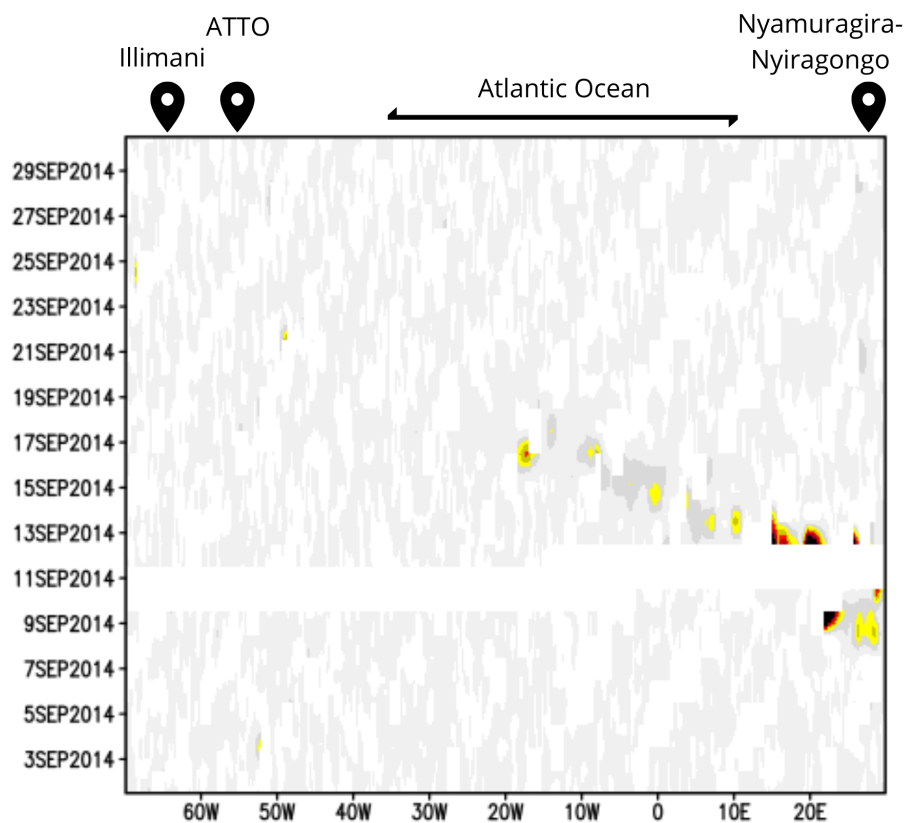


Figure S1. Planetary boundary layer OMI SO₂ Hovmöller plot corresponding to a latitude daily average (16.5°S to 0°) from September 2014. Indicated at the top of the plot are the longitude locations of: the Illimani, the ATTO station, the Nyamuragira-Nyiragongo volcanoes, and the approximate west to east extension of the south Atlantic Ocean.

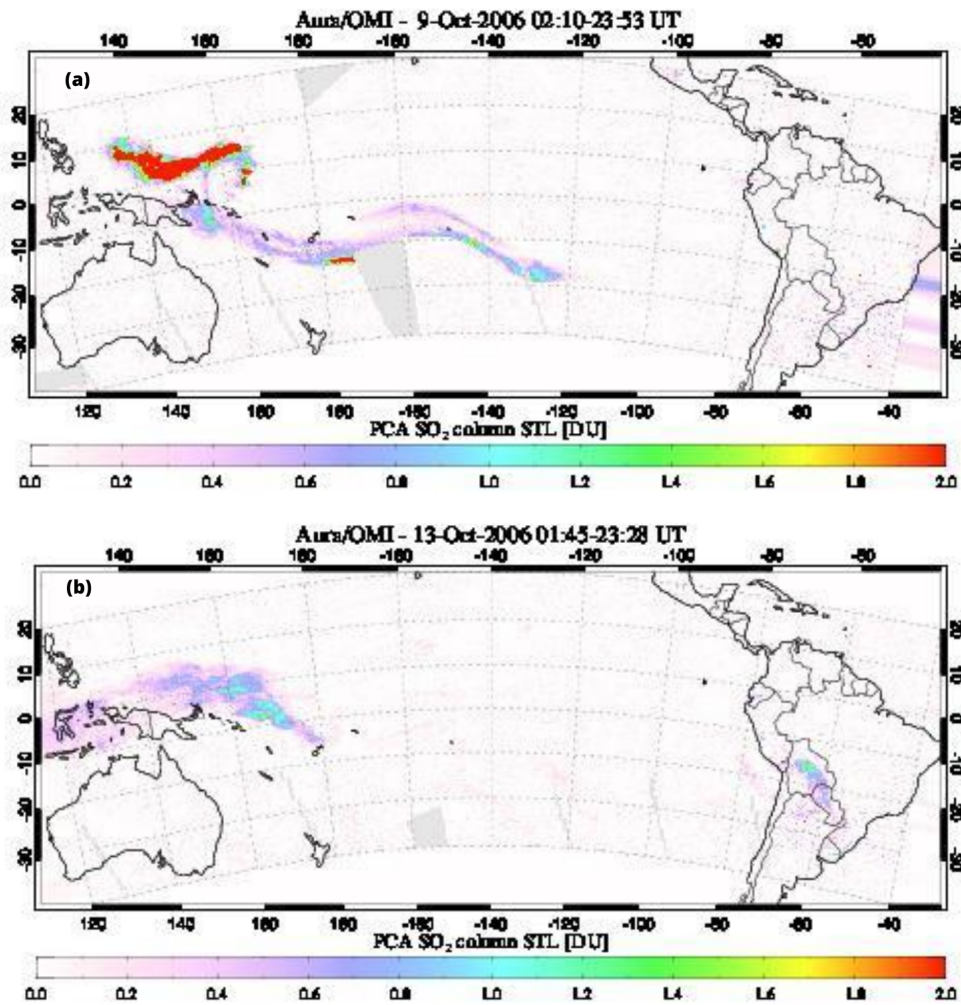


Figure S2. Rabaul volcano SO₂ plume toward South America, on October 9th (a) and 13th (b) of 2006, detected by the Ozone Monitoring Instrument (OMI) on the Aura satellite (Atmospheric Chemistry and Dynamics Laboratory, NASA, <https://so2.gsfc.nasa.gov>).

Table S1. Correlations between the enrichment factors of the elements emitted by metallurgical smelting and refining processes. All these correlations are significant at the 95% level.

	As	Bi	Cd	Cu
As	1			
Bi	0.5	1		
Cd	0.5	0.4	1	
Cu	0.6	0.4	0.4	1

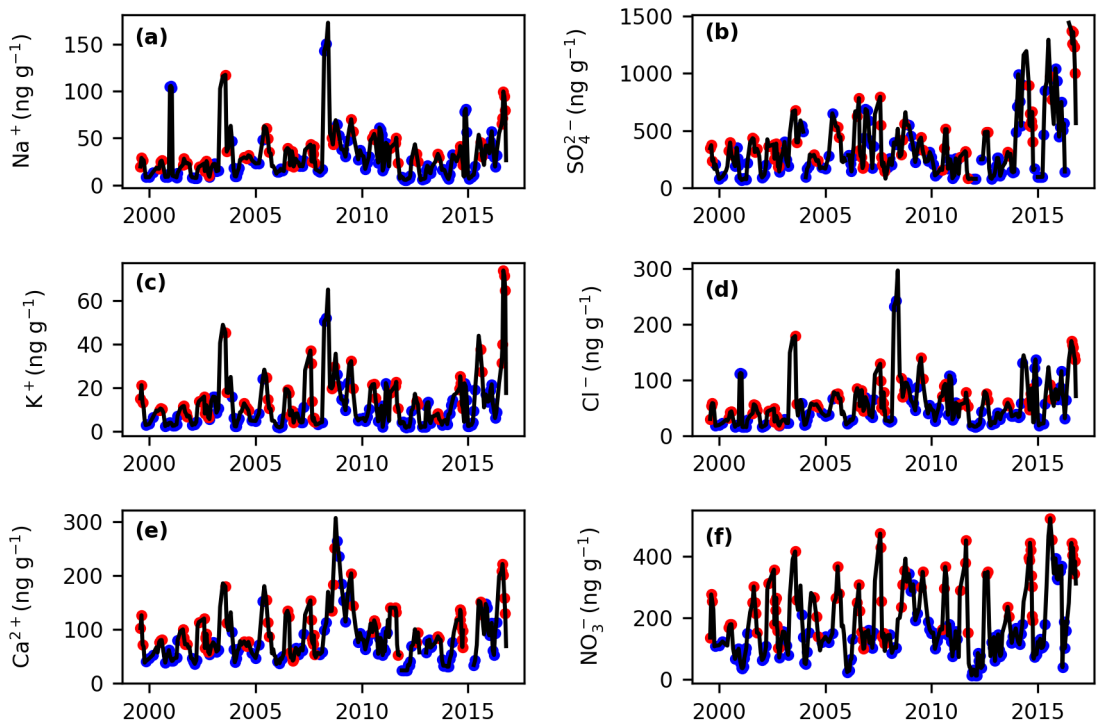


Figure S3. Major ions concentration record for the 1999–2016 period. Records are expressed by a 3-sample mean. Blue and red dots denote to samples classified as “wet” and “dry”, respectively.

Table S2. Correlations between elemental concentrations and their first principal component.

Significant correlations at the 95% and higher than 0.50 are shown in bold. The explained variance is indicated in the last line.

	PC1e
Li	0.85
Na	0.74
Mg	0.97
Al	0.94
S	0.45
K	0.83
Ca	0.76
Sc	0.91
Mn	0.88
Co	0.92
Cu	0.91
As	0.91
Sr	0.94
Cs	0.91
Pb	0.95
Bi	0.59
U	0.93
Var(%)	74

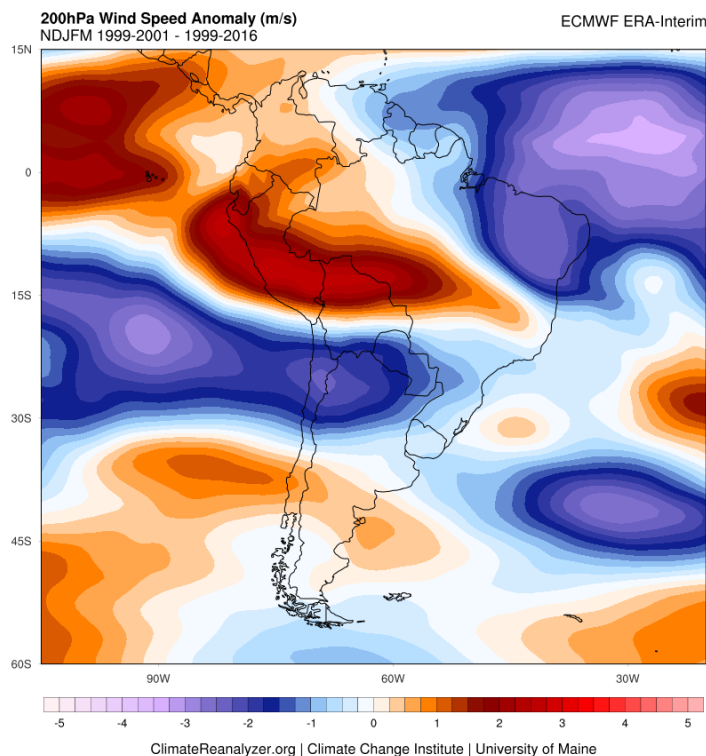


Figure S4. Austral summer (NDJFM) wind speed anomalies at the 200 hPa level, when comparing the period 1999–2001 to the 1999–2016 climatology. The higher speeds over northwestern South America suggests an intensified and southward displaced Bolivian high. Data from the ERA-Interim reanalysis, obtained at the Climate Reanalyzer (<https://climatereanalyzer.org>).

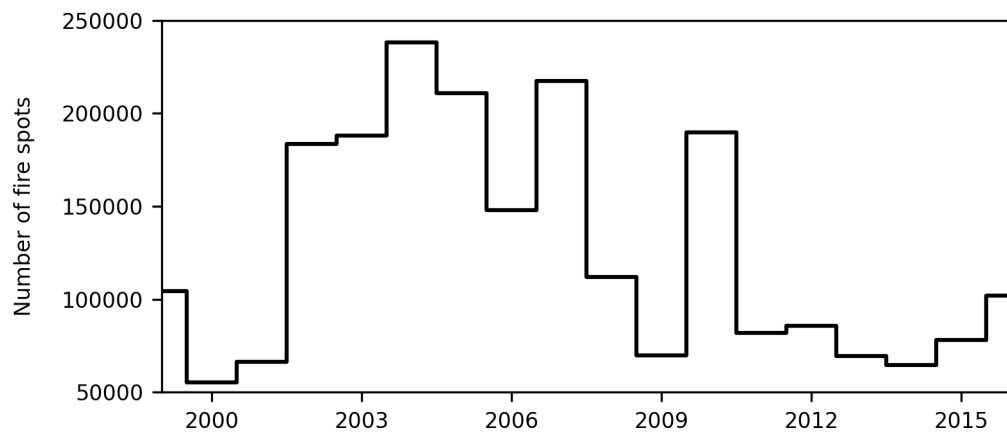


Figure S5. Total number of fire spots in Bolivia, western Brazil (states of Mato Grosso do Sul, Mato Grosso and Rondônia), and Paraguay. Data from the Brazilian Aerospace Agency (INPE) available at queimadas.dgi.inpe.br.

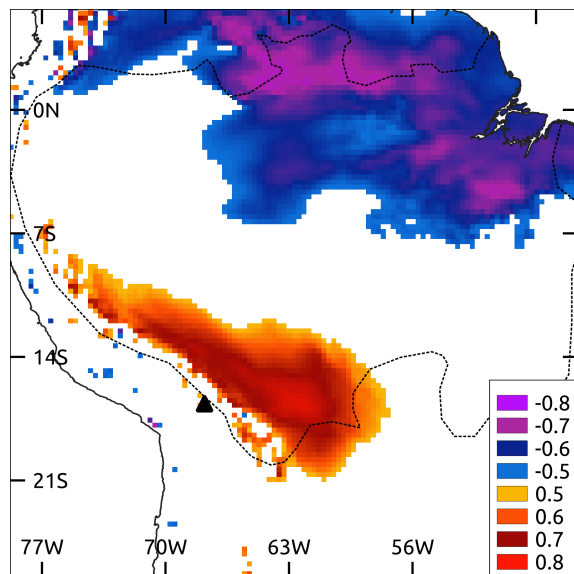


Figure S6. Spatial correlations (significant at the 95% level) during the months MJJAS (2000–2016 period) between the manganese enrichment factor and zonal winds at the 850-hPa level (ERA5 reanalysis). The black triangle indicates the Illimani site, and the dotted line delimits the Amazon basin.

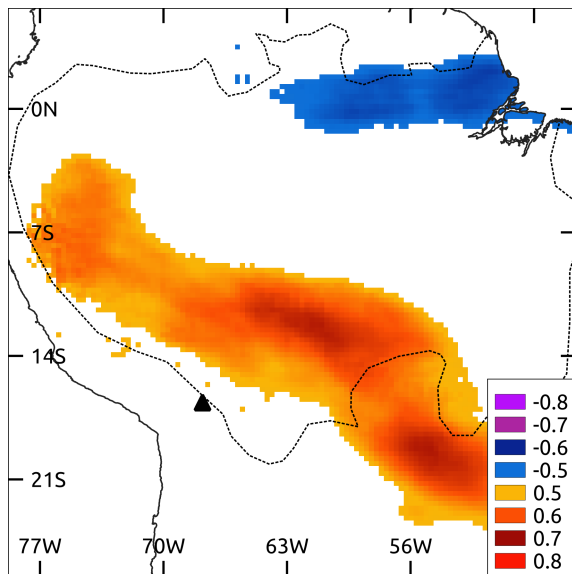


Figure S7. Spatial correlations (significant at the 95% level) during the months MJJAS (2000–2016 period) between the manganese enrichment factor and the relative humidity at the 500-hPa level (ERA5 reanalysis). The black triangle indicates the Illimani site, and the dotted line delimits the Amazon basin.

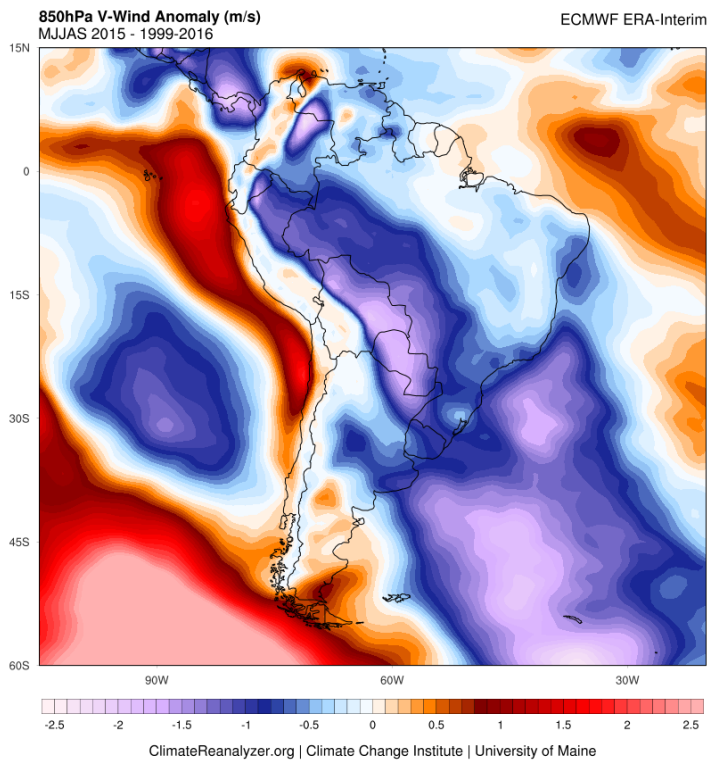


Figure S8. Austral winter (MJJAS) meridional wind anomalies at the 850 hPa level, when comparing the year of 2015 with the 1999–2016 climatology. The stronger northerly flux over western South America suggests intensified low level jets. Data from the ERA-Interim reanalysis, obtained at the Climate Reanalyzer (<https://climatereanalyzer.org>).

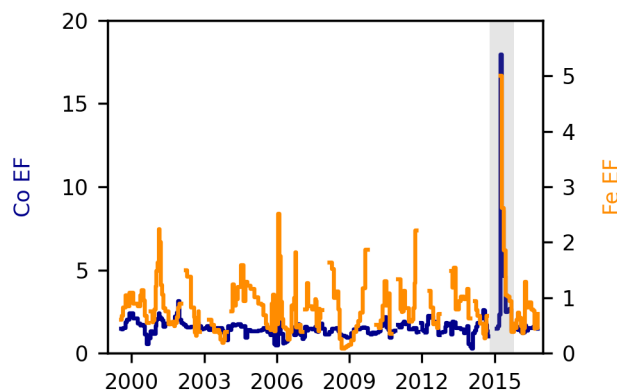


Figure S9. Anomalous enrichment for cobalt (blue) and iron (orange). The vertical gray area highlights the early 2015 period.

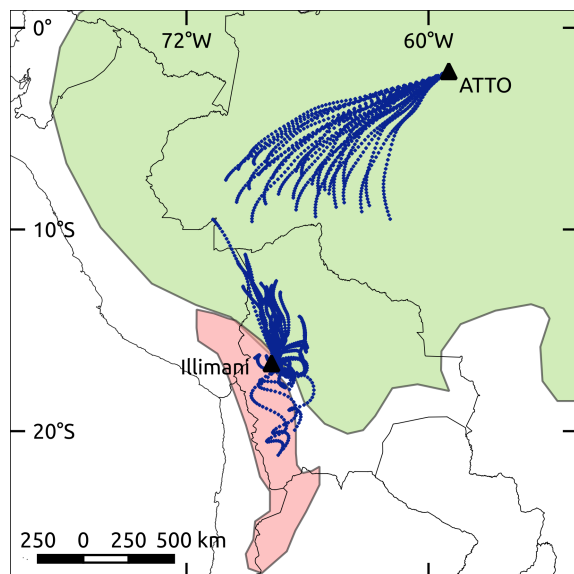


Figure S10. Two-hour air mass trajectories for the April 3–5, 2015 period (blue lines). Backward trajectories over the Illimani started at 500 m above that site. Forward trajectories over ATTO started at 1500 m a.s.l. The green and red areas represent the Amazon basin and the Altiplano, respectively.