Credit: Laura Ticona

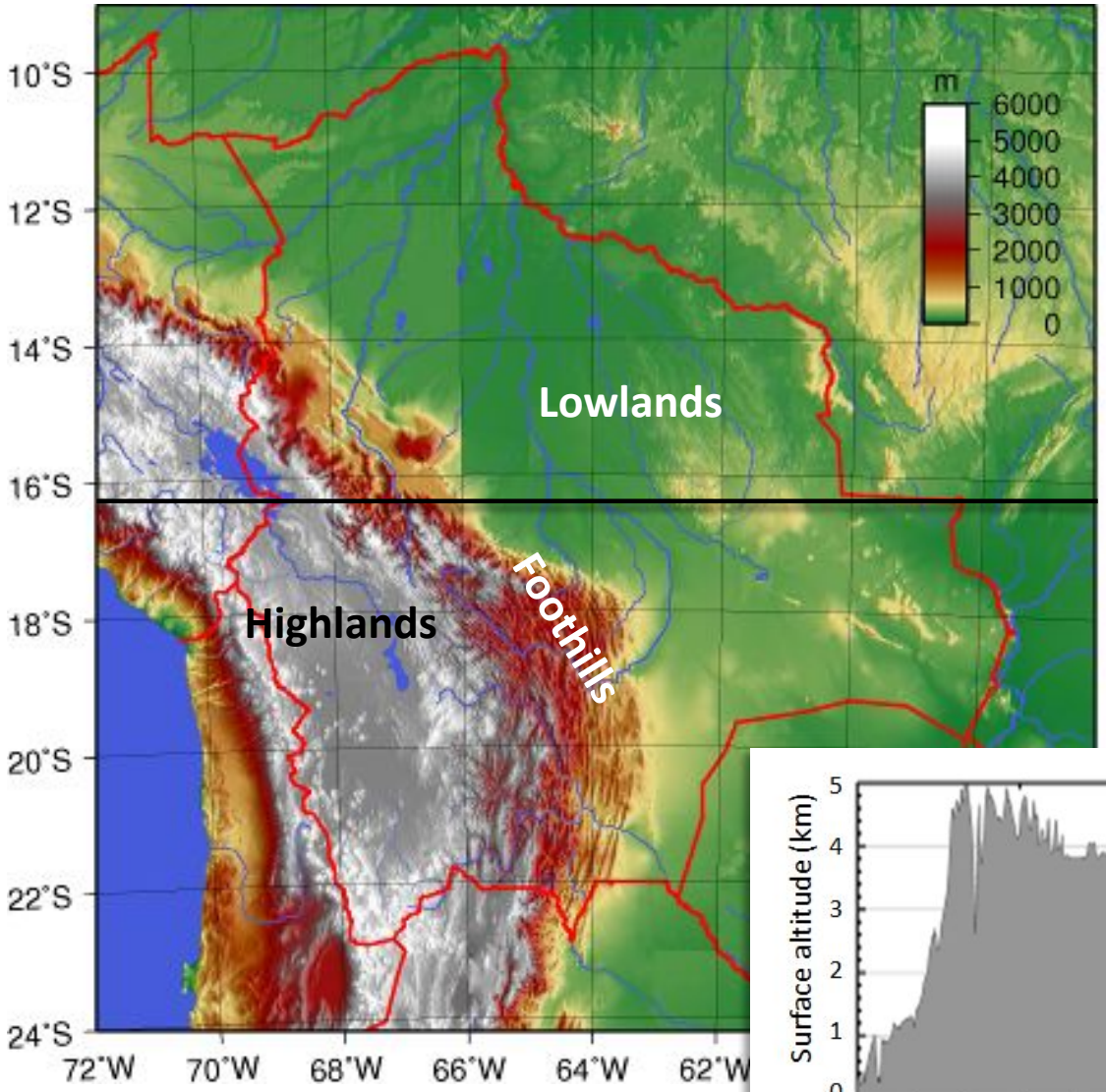
View from Ancohuma Mountain (5 000 m asl)

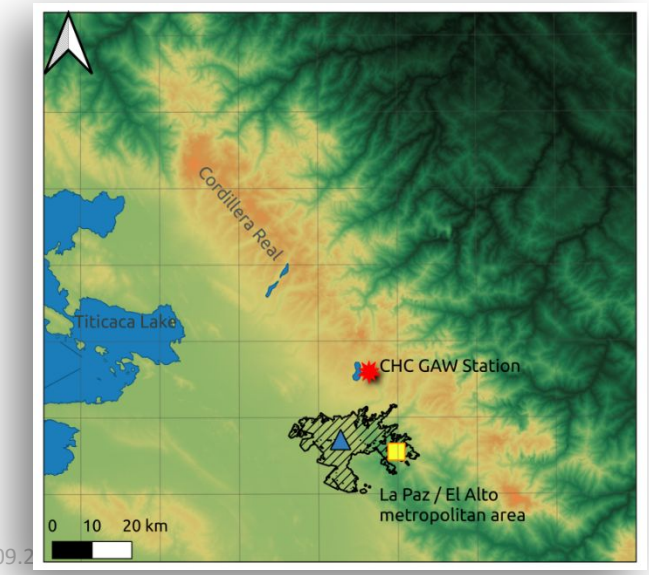
Intense transport of smoke to the Bolivian Andes:
Insights from a unique set of instruments located at different altitudes

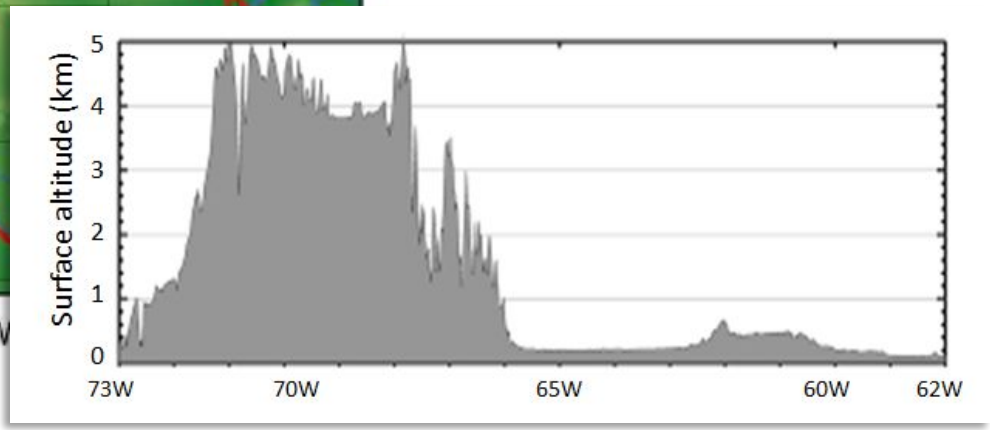
M. Andrade, P. Goloub, L. Ticona, F. Velarde, M.F. Sanchez, D. Guzman, L. Blacutt, R. Forno, R. Gutierrez, M. Pozadas, J. Calle, I. Moreno, F. Avila, M. Ramonet, O. Laurent, D. N. Whiteman, P. Laj

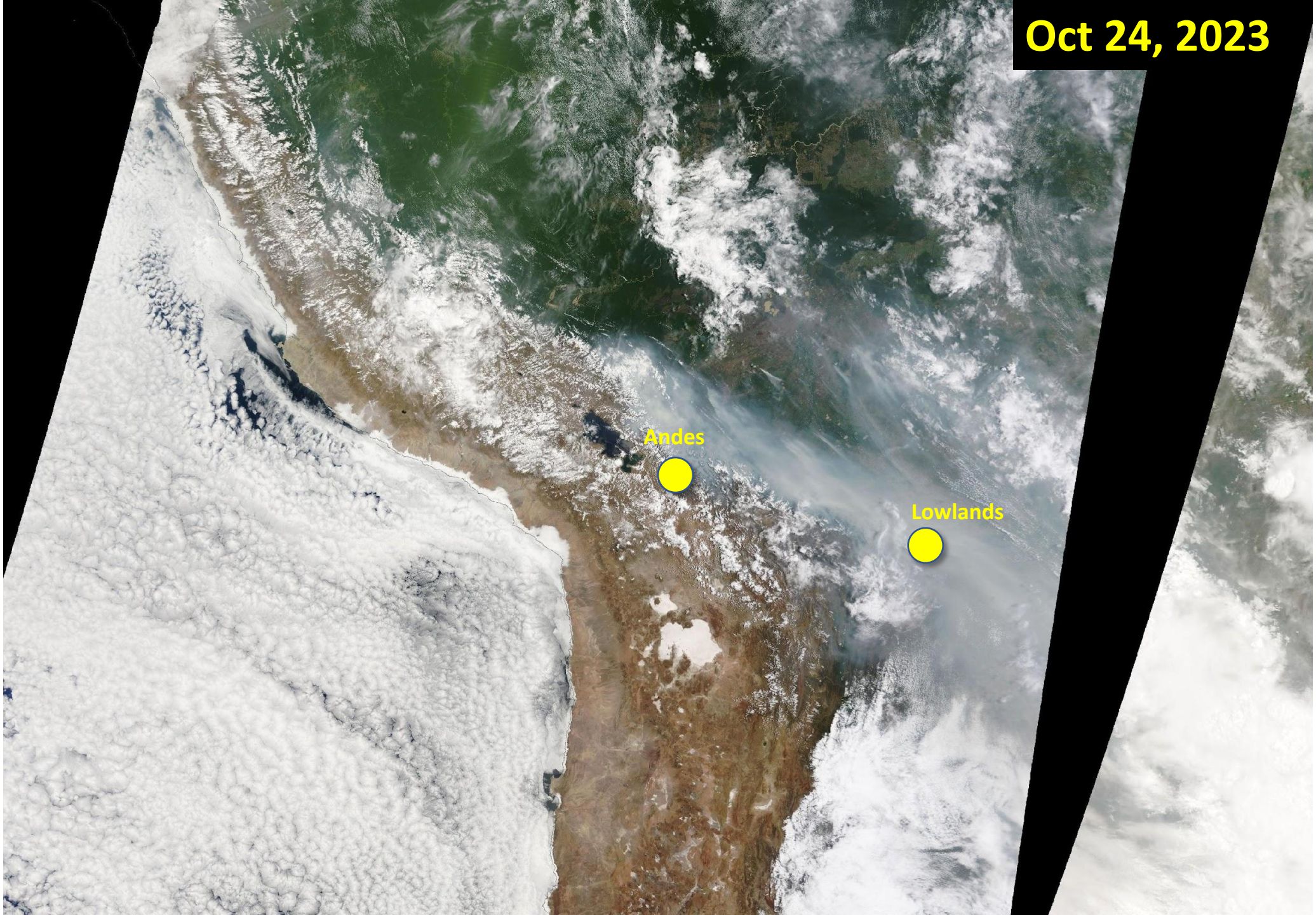
Introduction: Bolivia

- 1.1 million Sq. km
- 11.3 million inhabitants
- Most of them in three cities
- La Paz and El Alto: ~1.7 million people



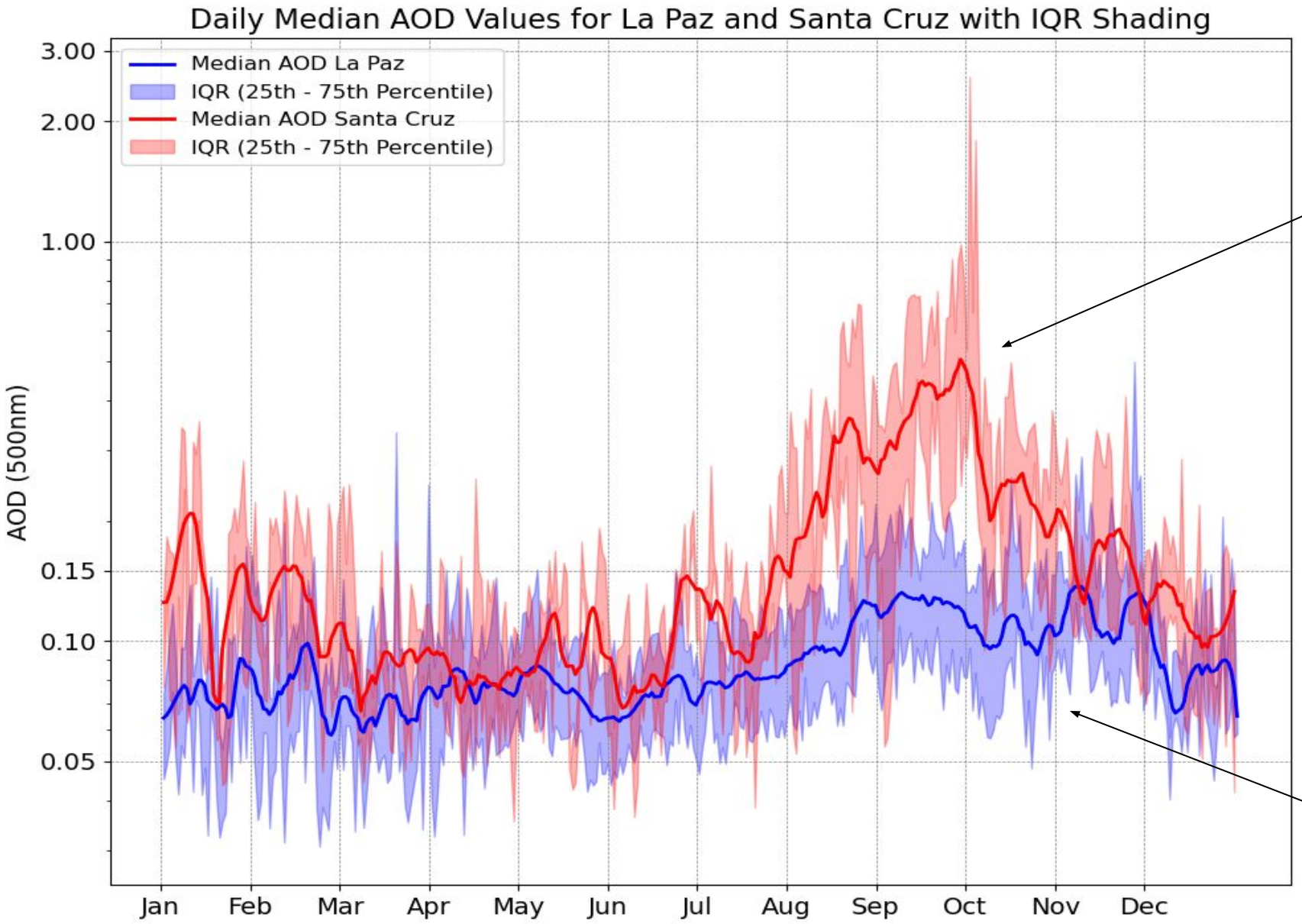






MODIS
on-board
TERRA

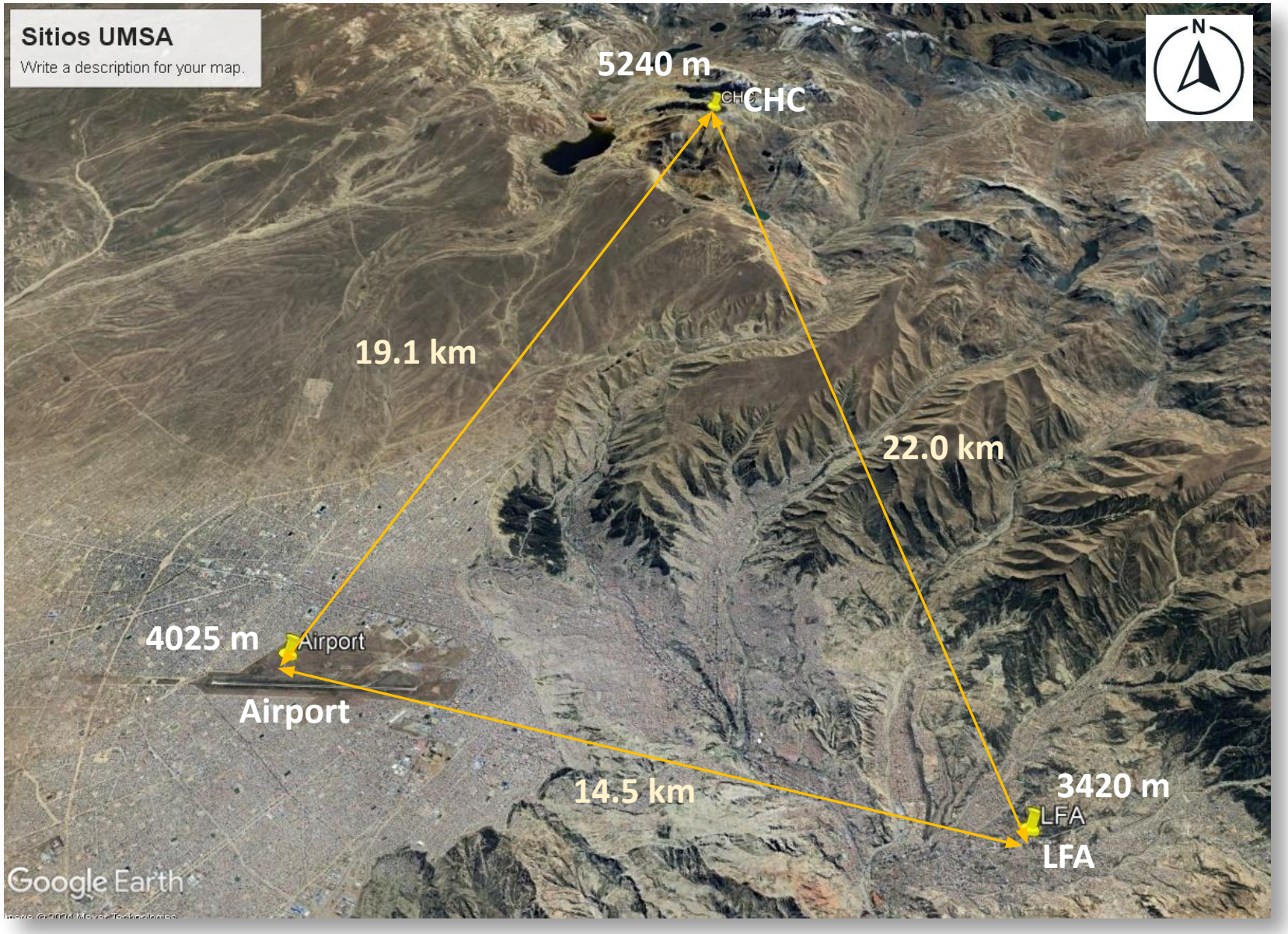
Climatologies



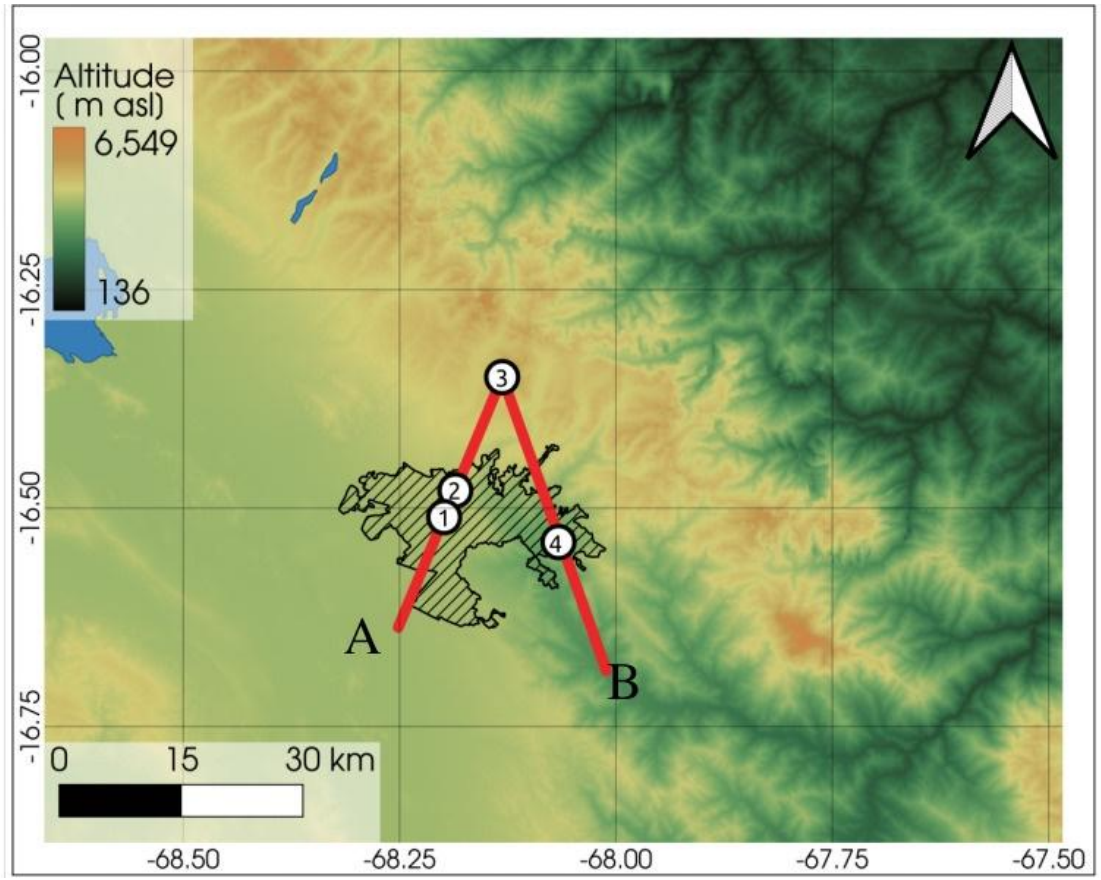
Lowlands

Andes

Sites with instrumentation



Sites and topography



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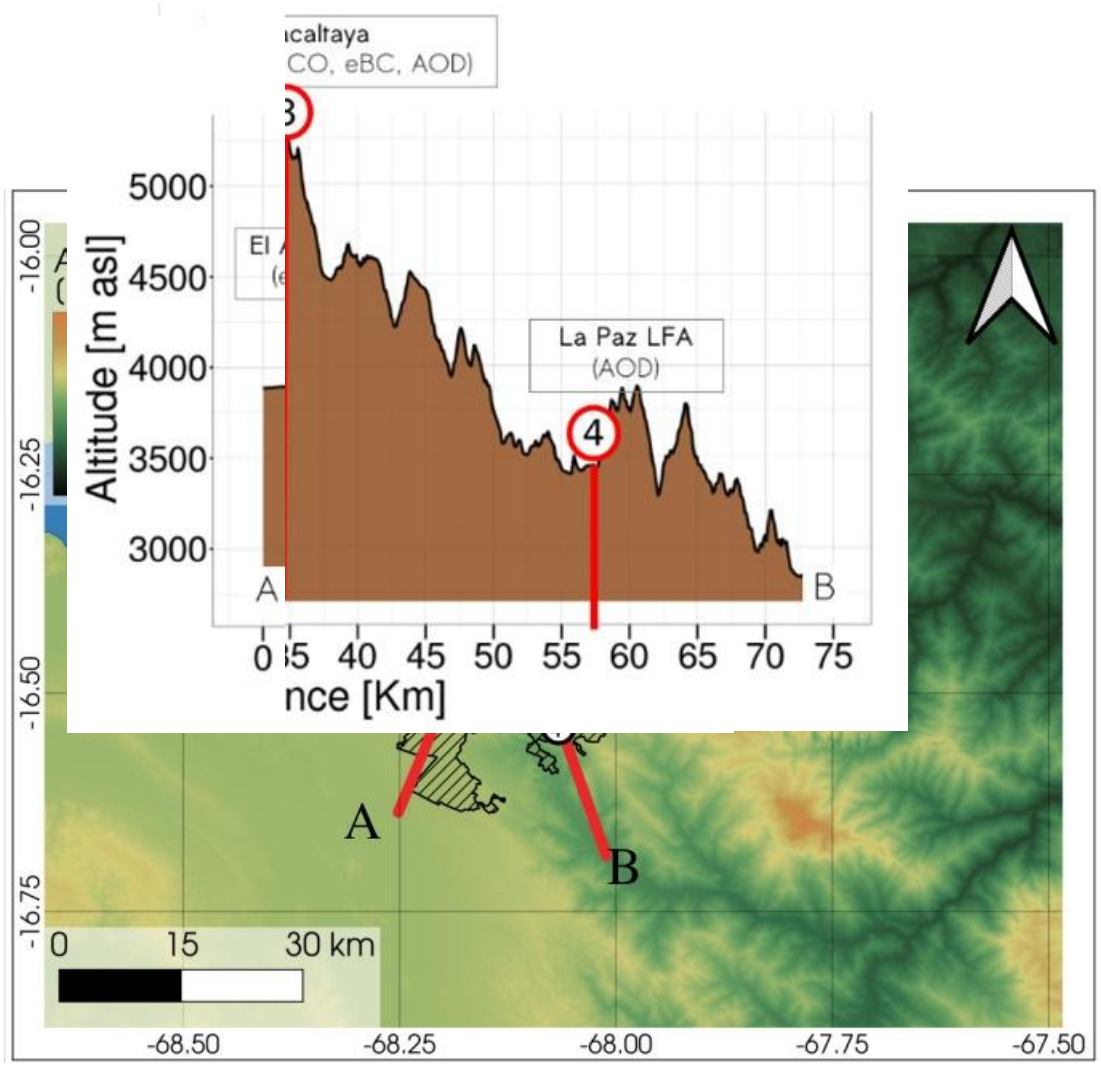
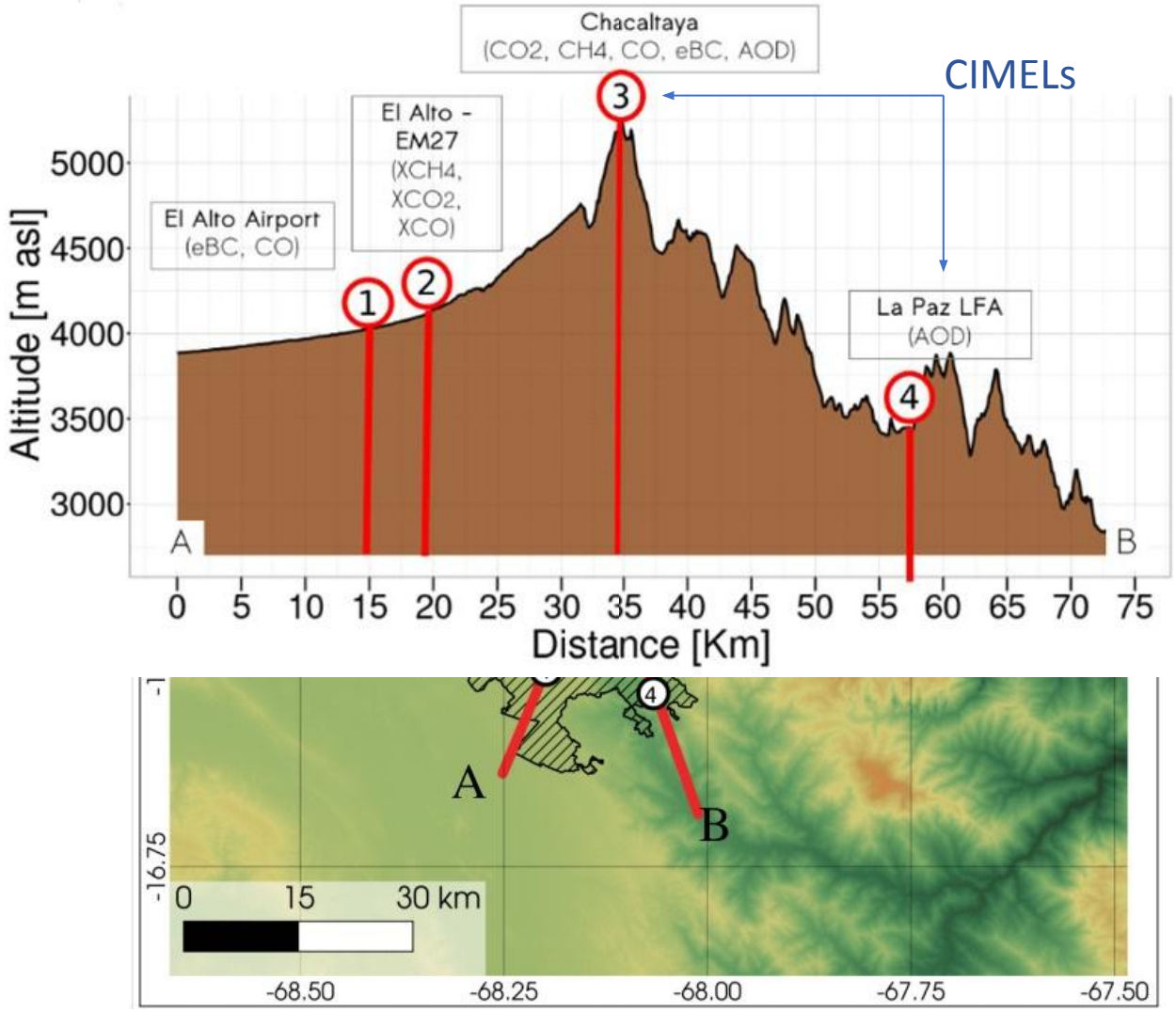
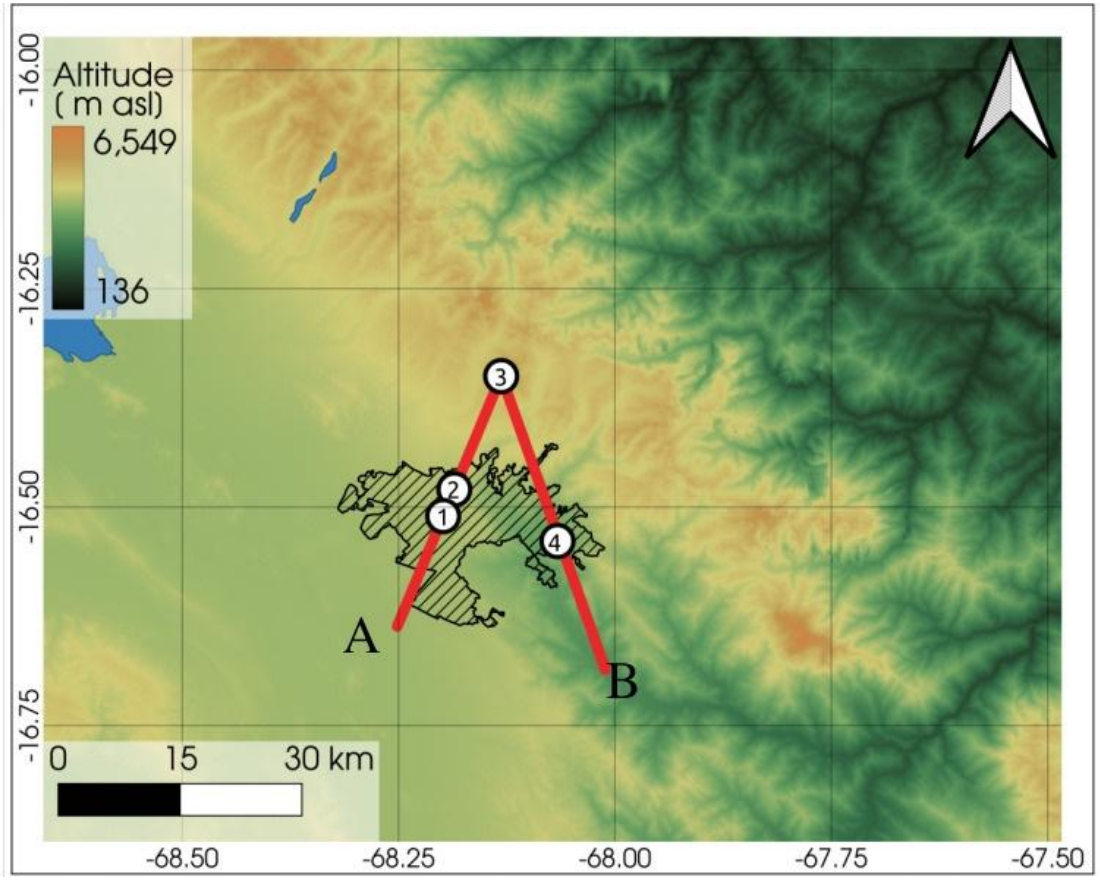
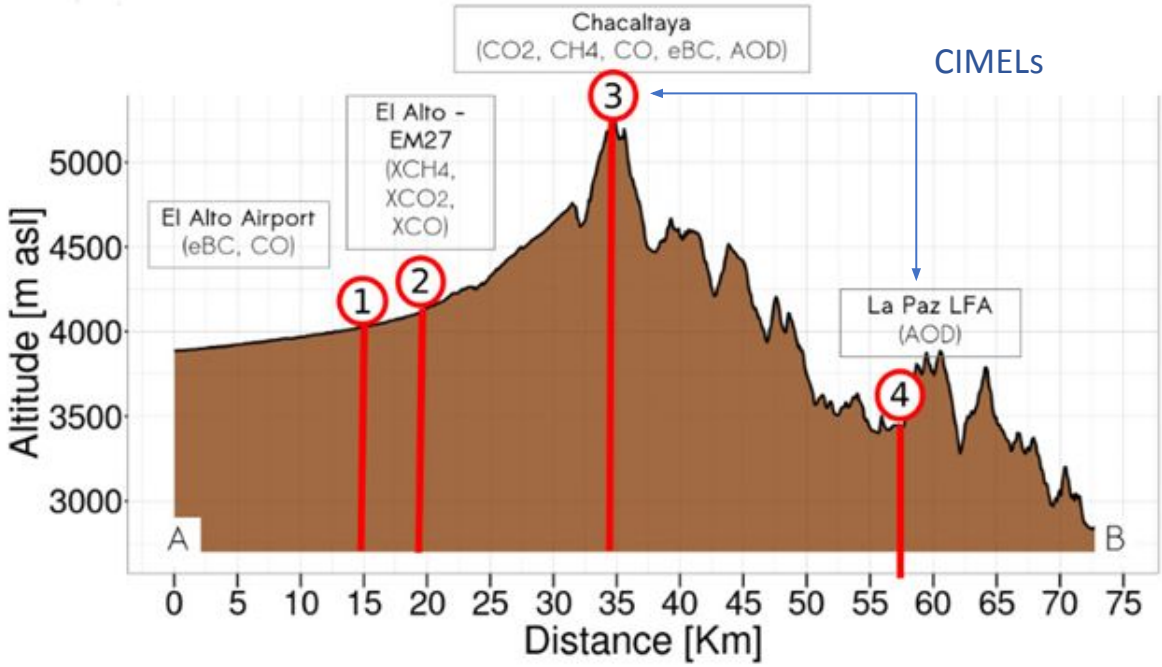


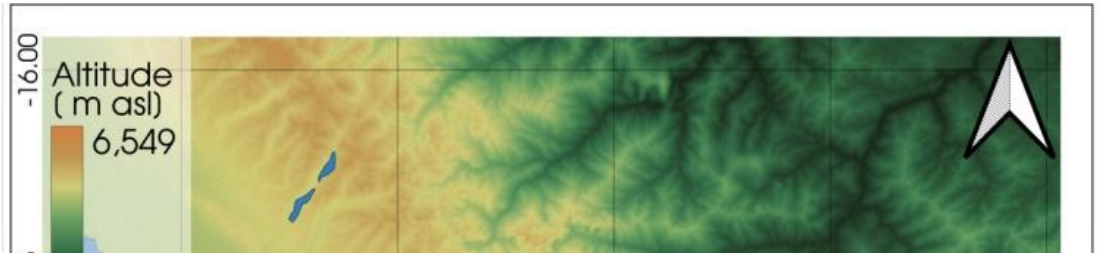
Sites and topography



Sites and topography

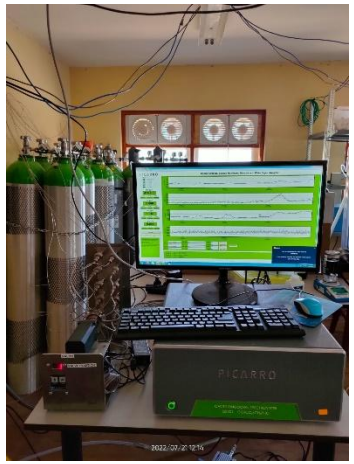






Instrumentation in CHC

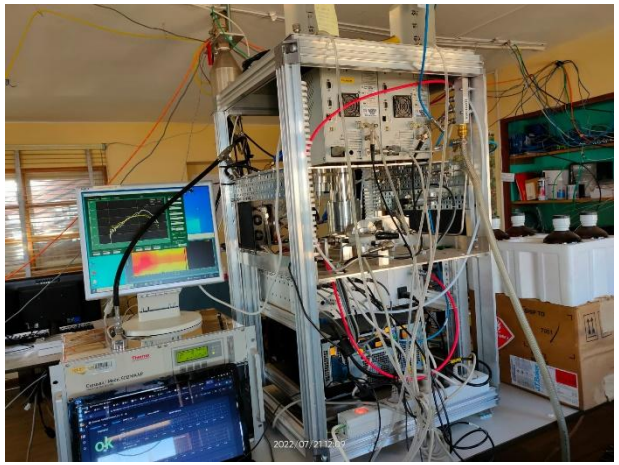
eBC



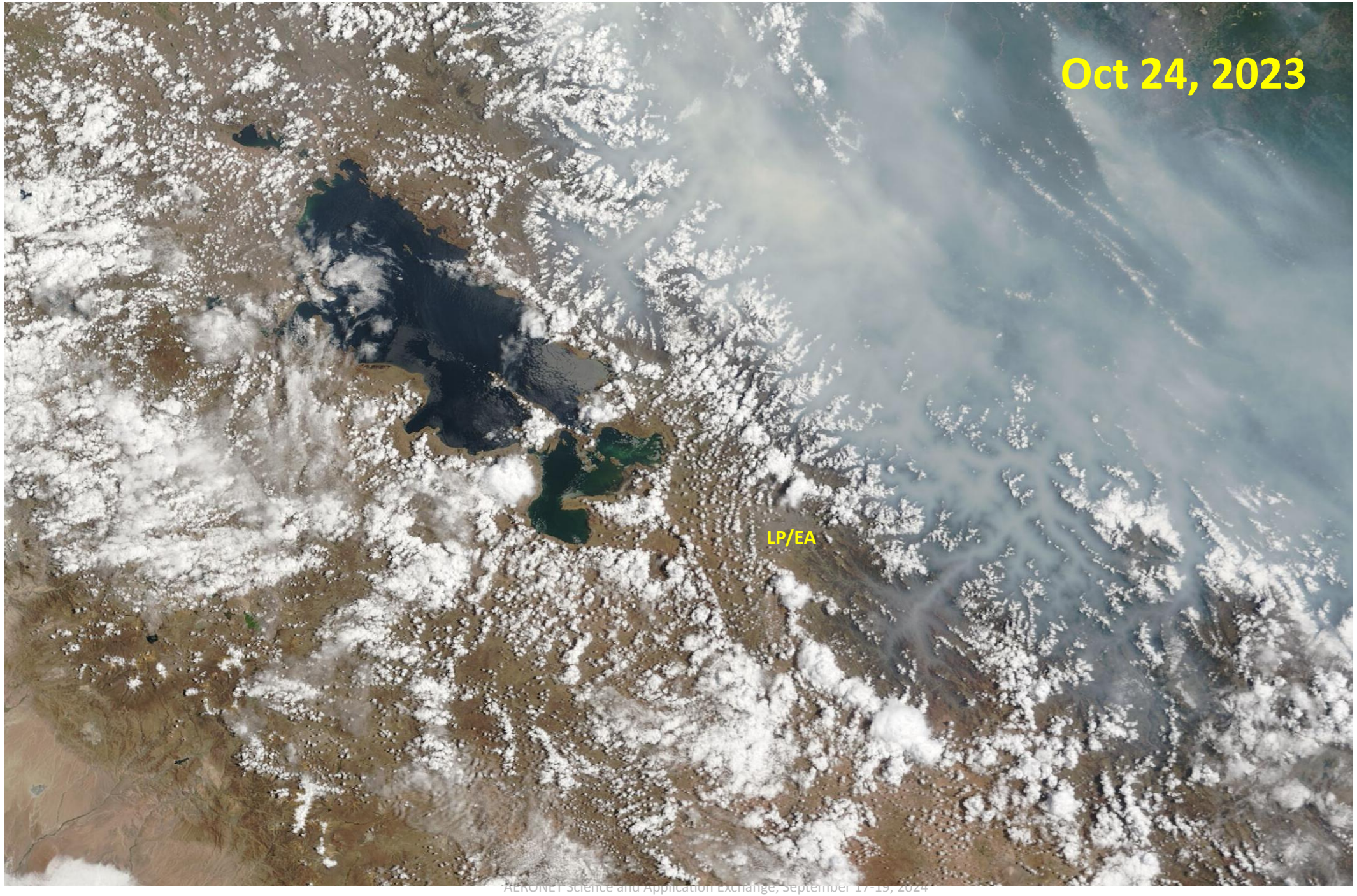
CO_2, CH_4, CO, H_2O

SO_2

O_3

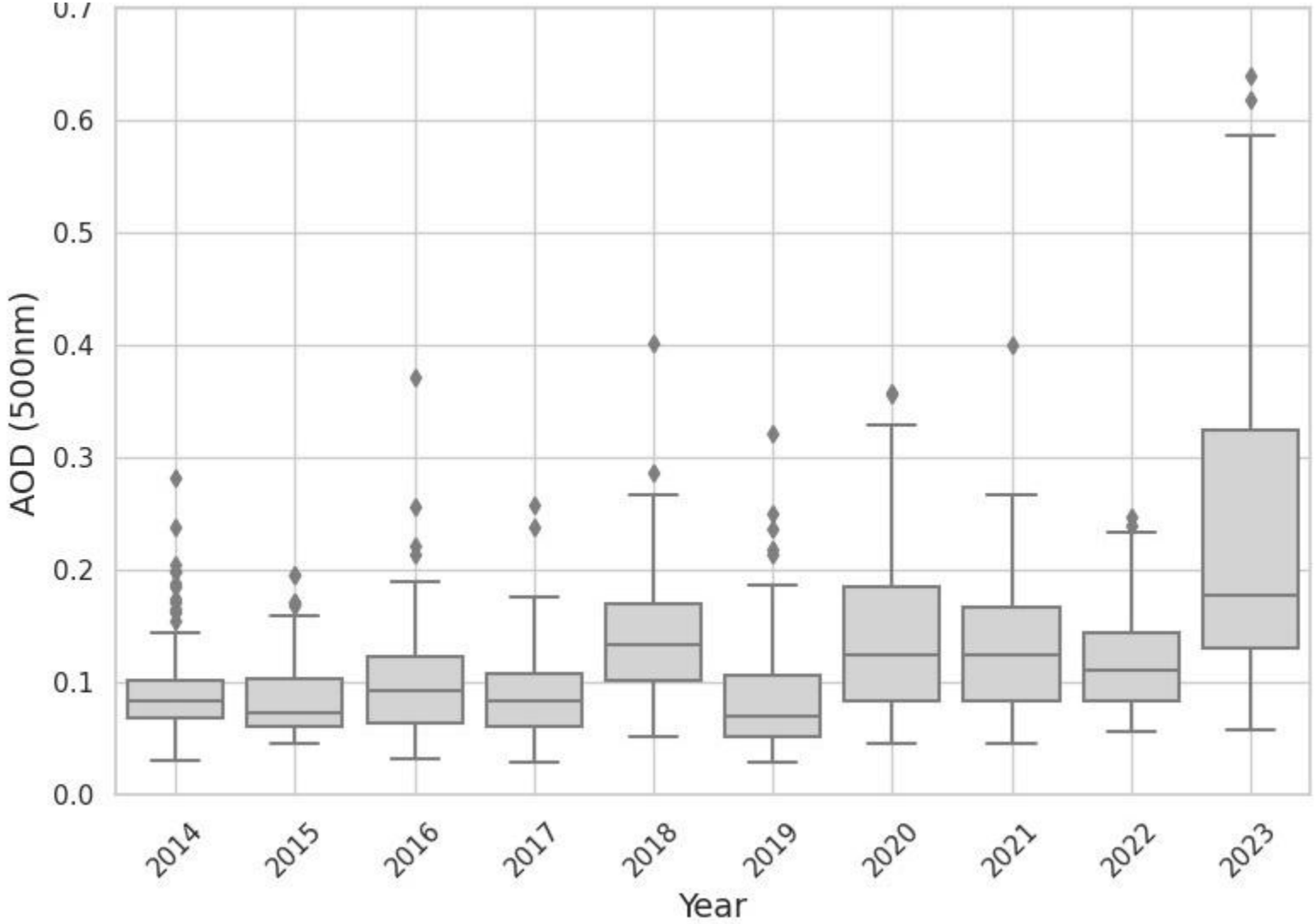


PNSD (10-500 nm)



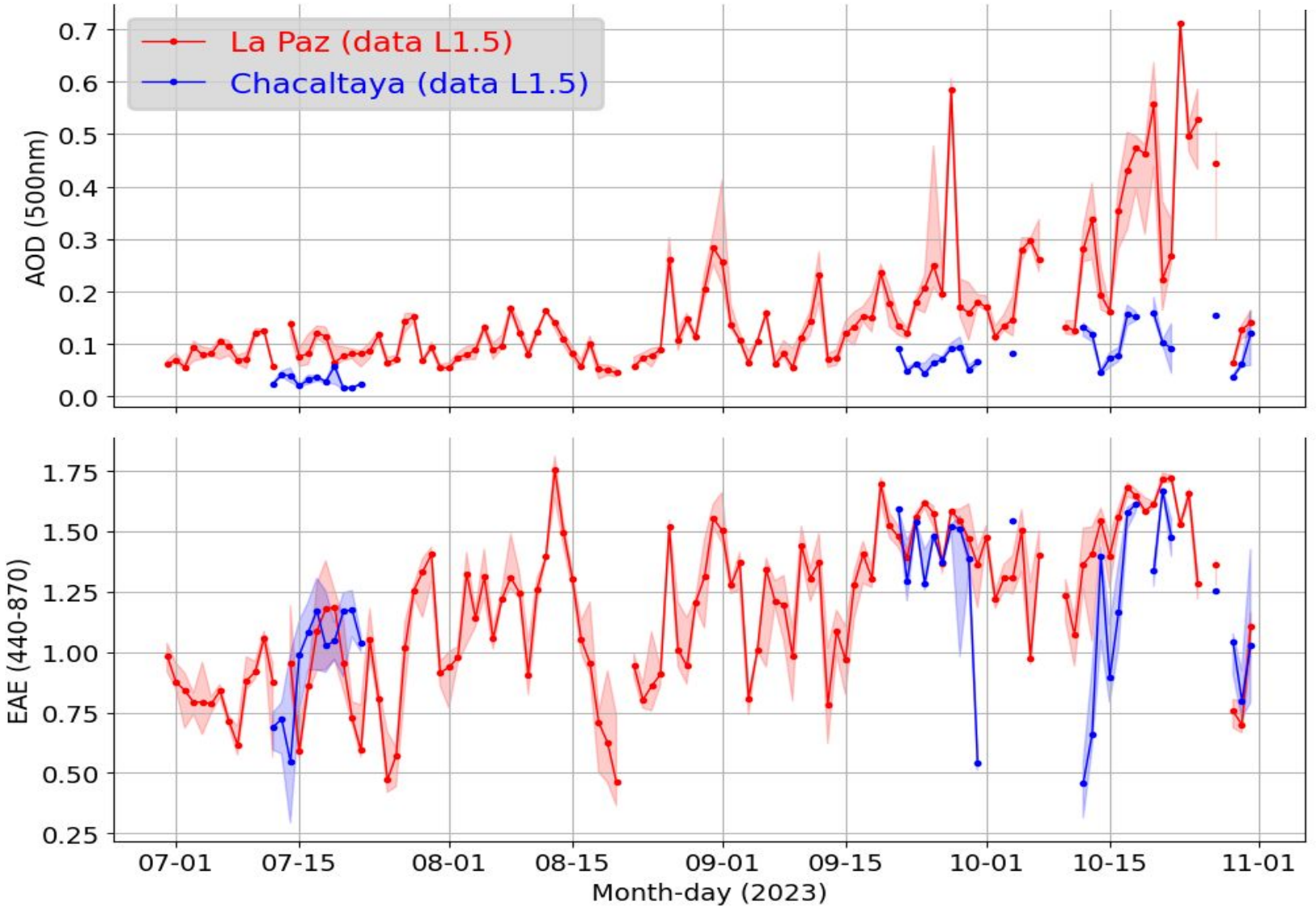
MODIS
on-board
TERRA

AOD in La Paz

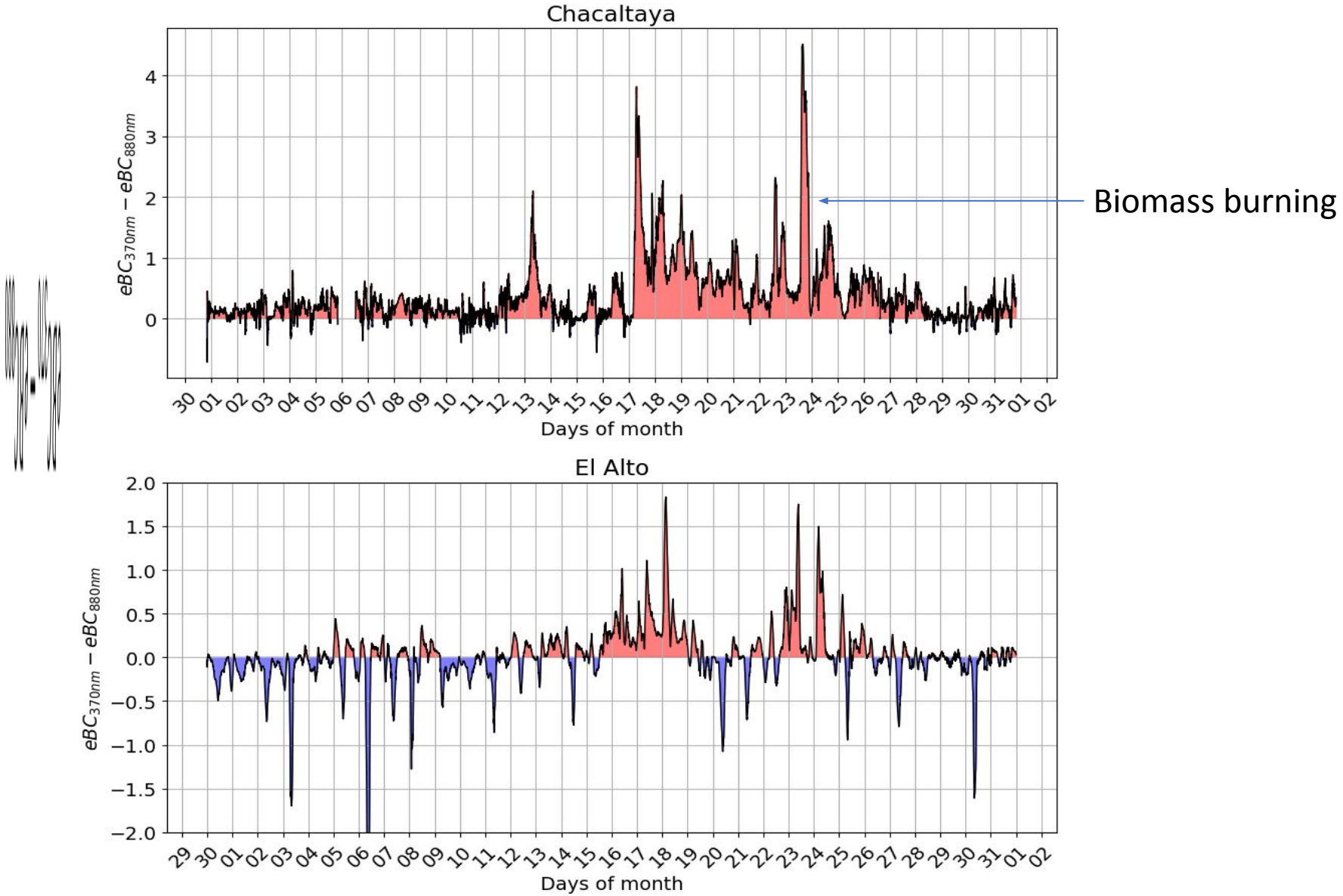

AOD (500nm)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Year

Data for October, 2023

CIMEL Daily data

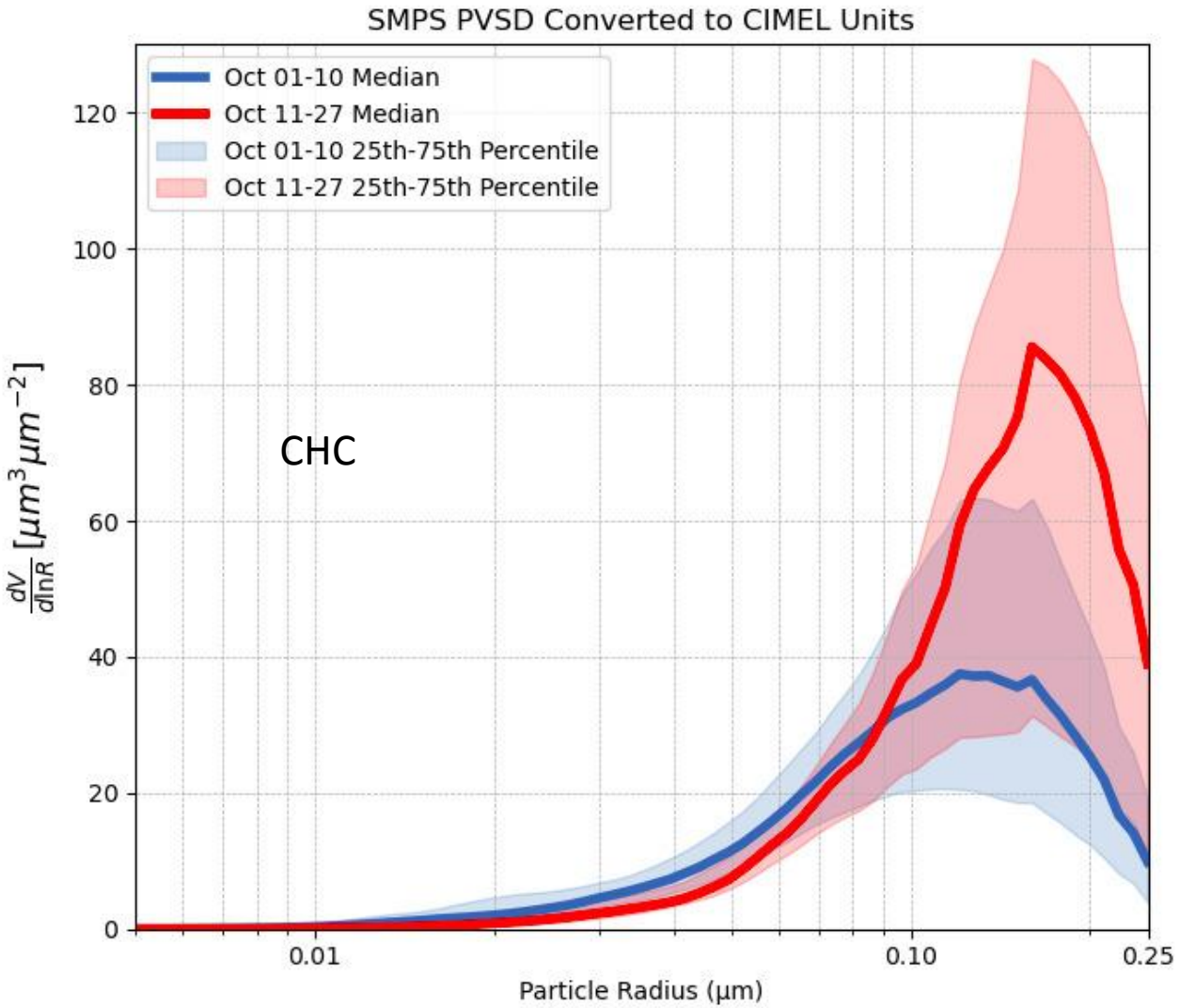


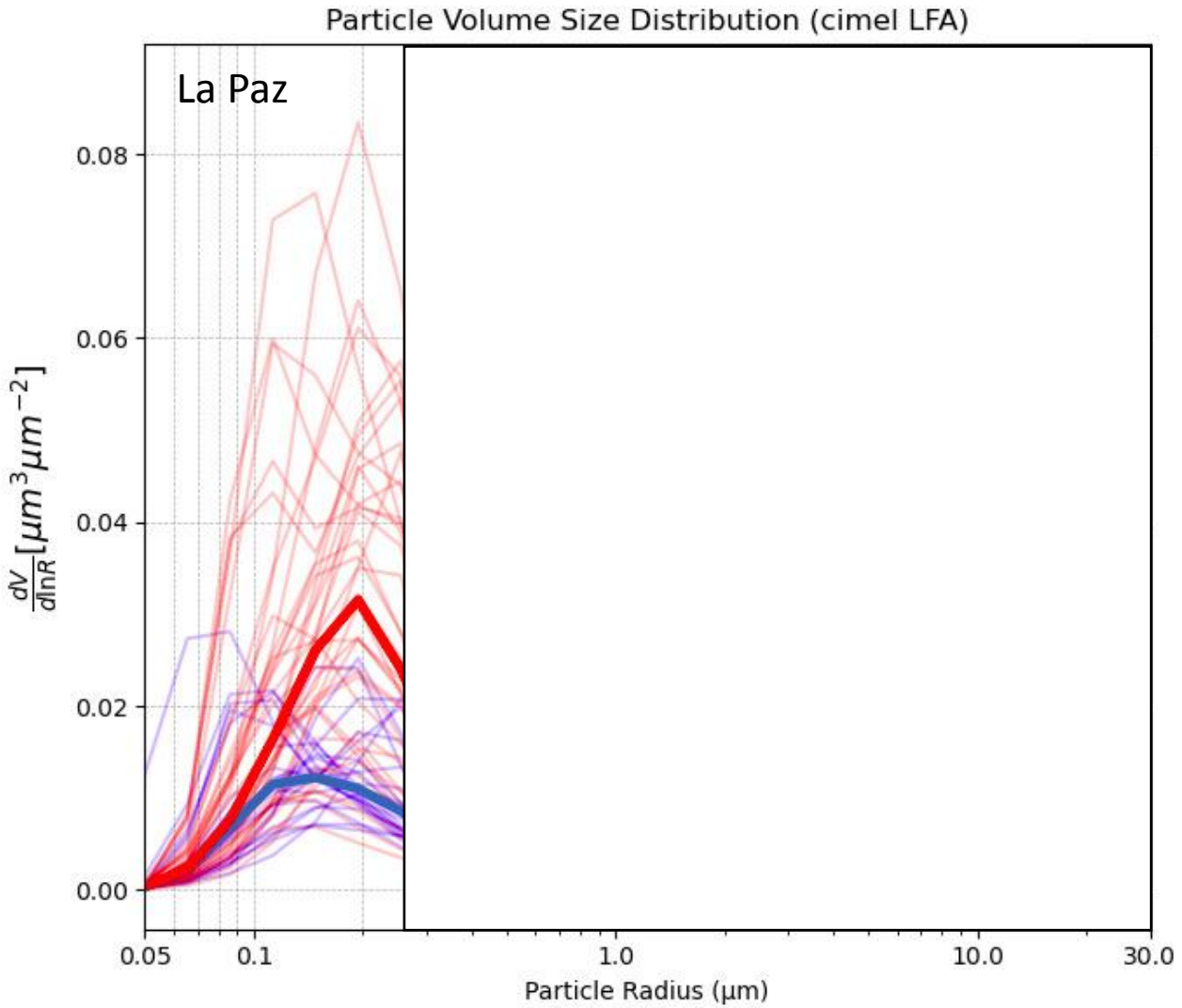
eBC from aethalometers



Biomass burning

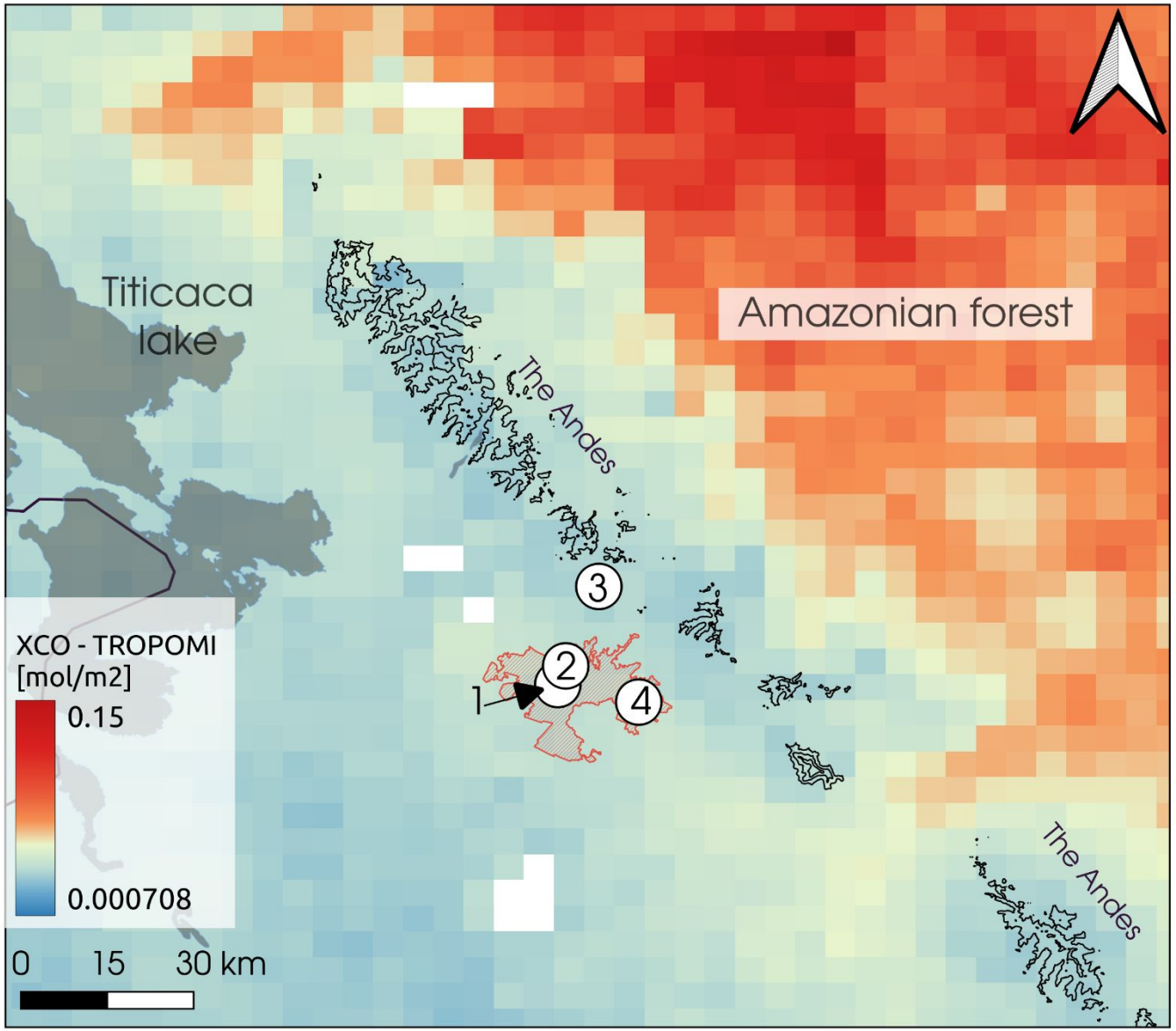
Particle Volume Size Distribution





Carbon monoxide from TROPOMI

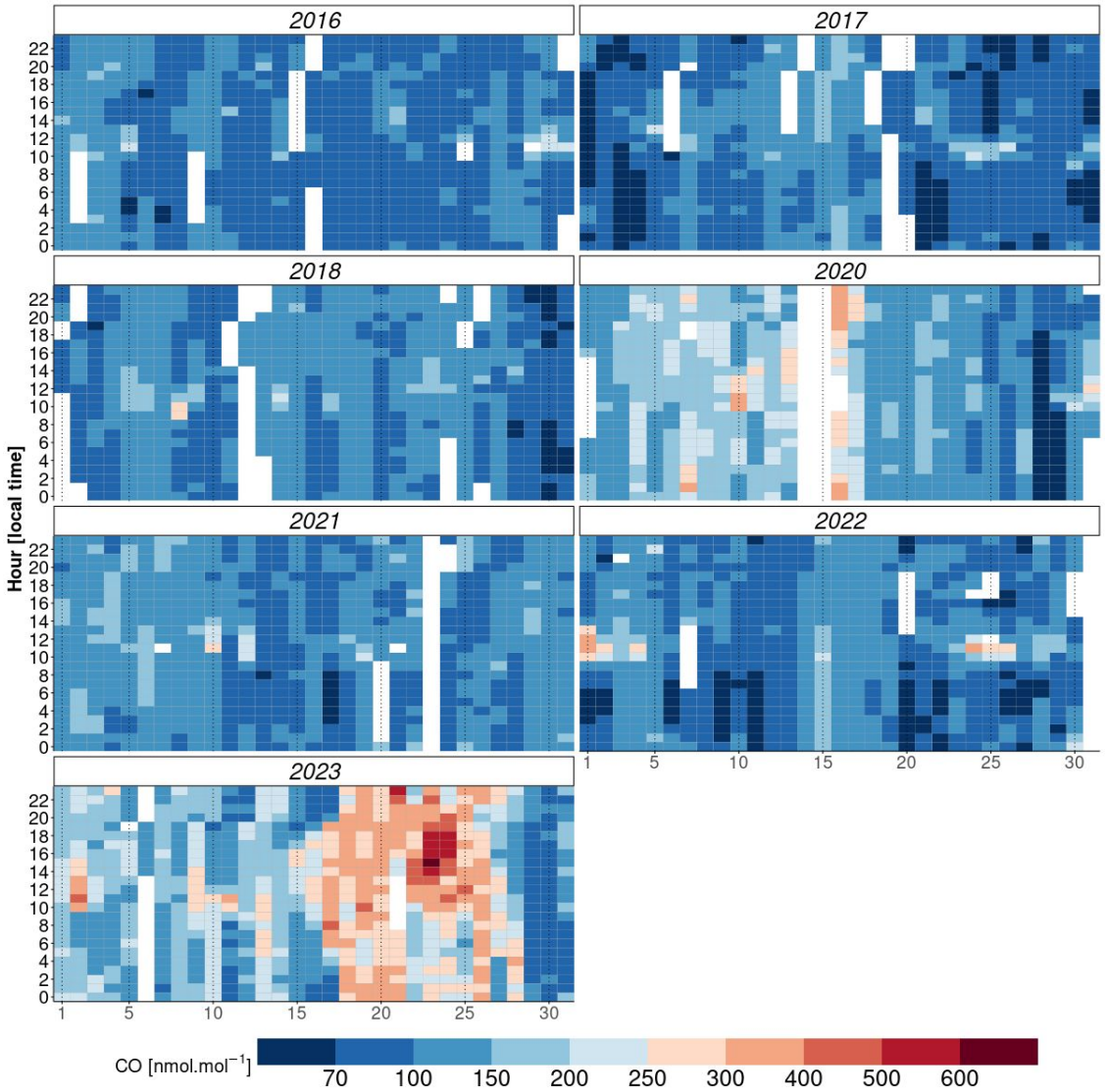
Average for October 18-28, 2023



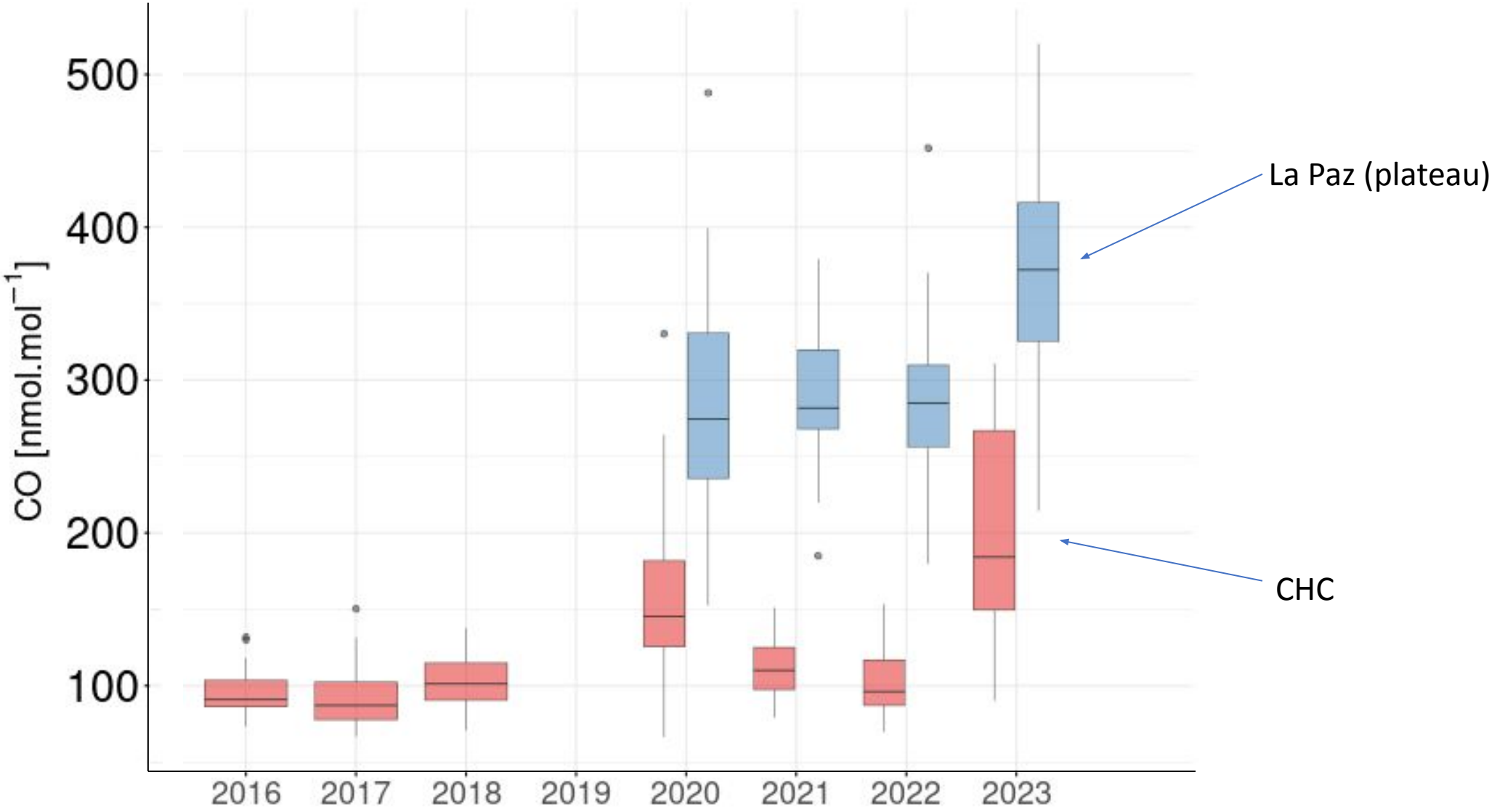
Carbon monoxide from surface (Picarro)

For October 2016-2023

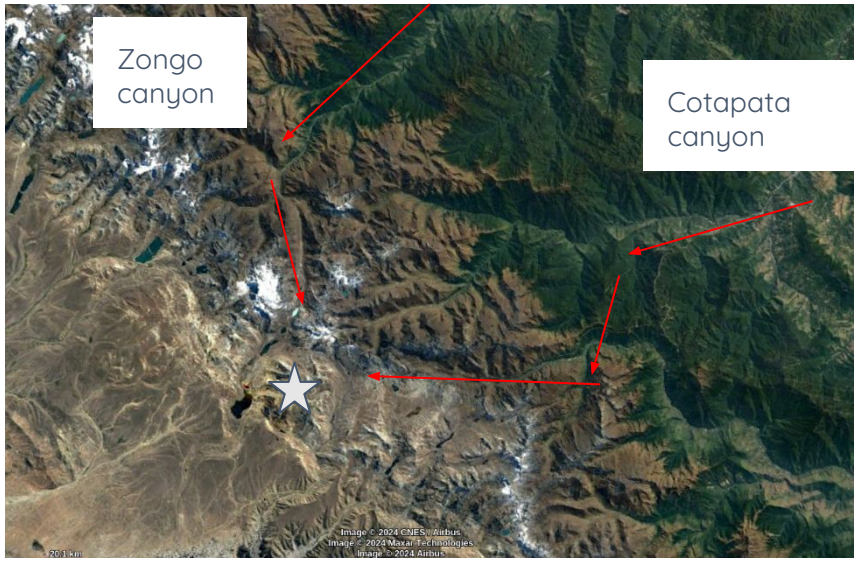
CHC



Carbon monoxide
(October)



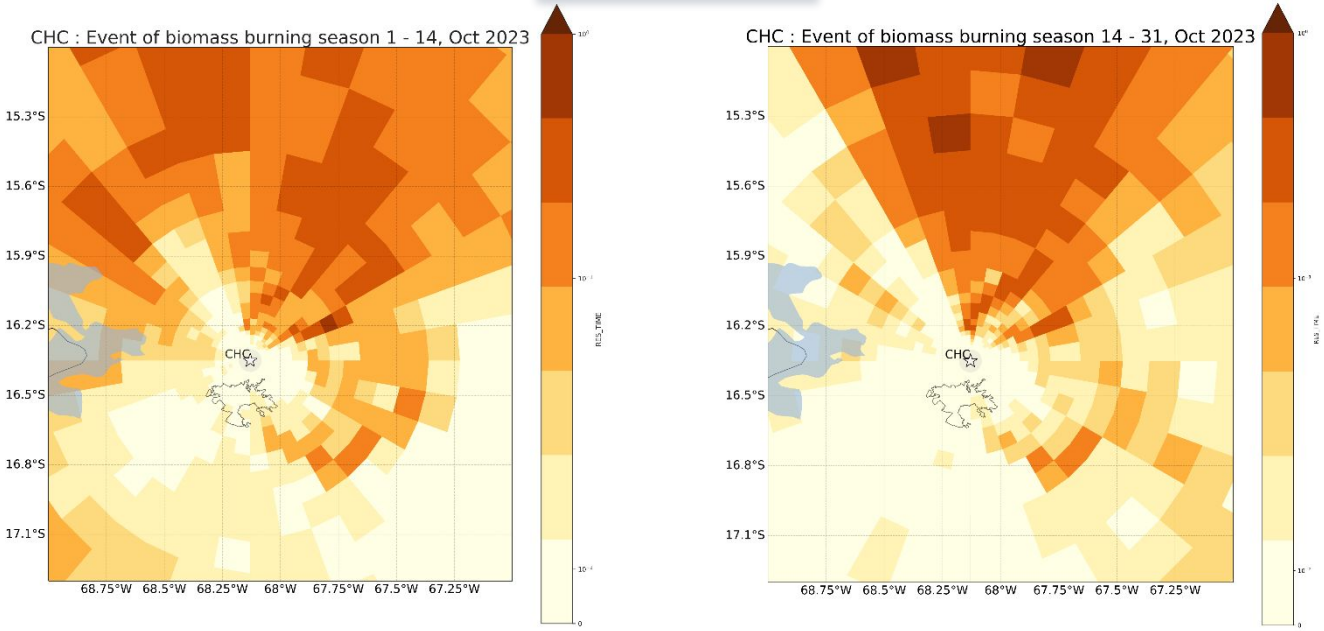
Back trajectories for October, 2023



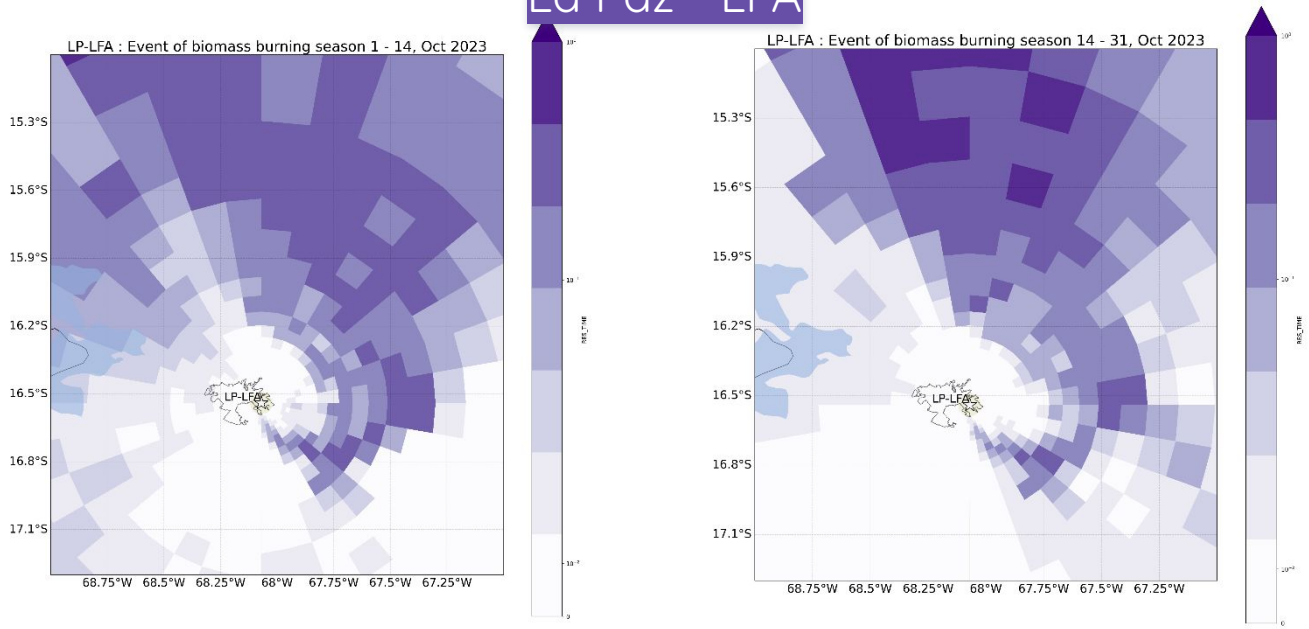
1-14

Chacaltaya

15-31



La Paz - LFA



Conclusions

- Imagery and data from satellite-borne instruments show large amounts of smoke in the lowlands of Bolivia and its neighboring countries.
- Air masses, under the right meteorological conditions, transport this smoke into the high Andean mountains.
- A clear signal of the increase of the concentration of particulate matter and carbon monoxide is measured by different instruments located in the metropolitan area of La Paz (3300-4100 m asl).
- Values of AOD up to 0.7 were measured in La Paz (average ~0.1).
- But this signal was also observed at 5240 m asl, where AOD of ~0.2 were observed (average .

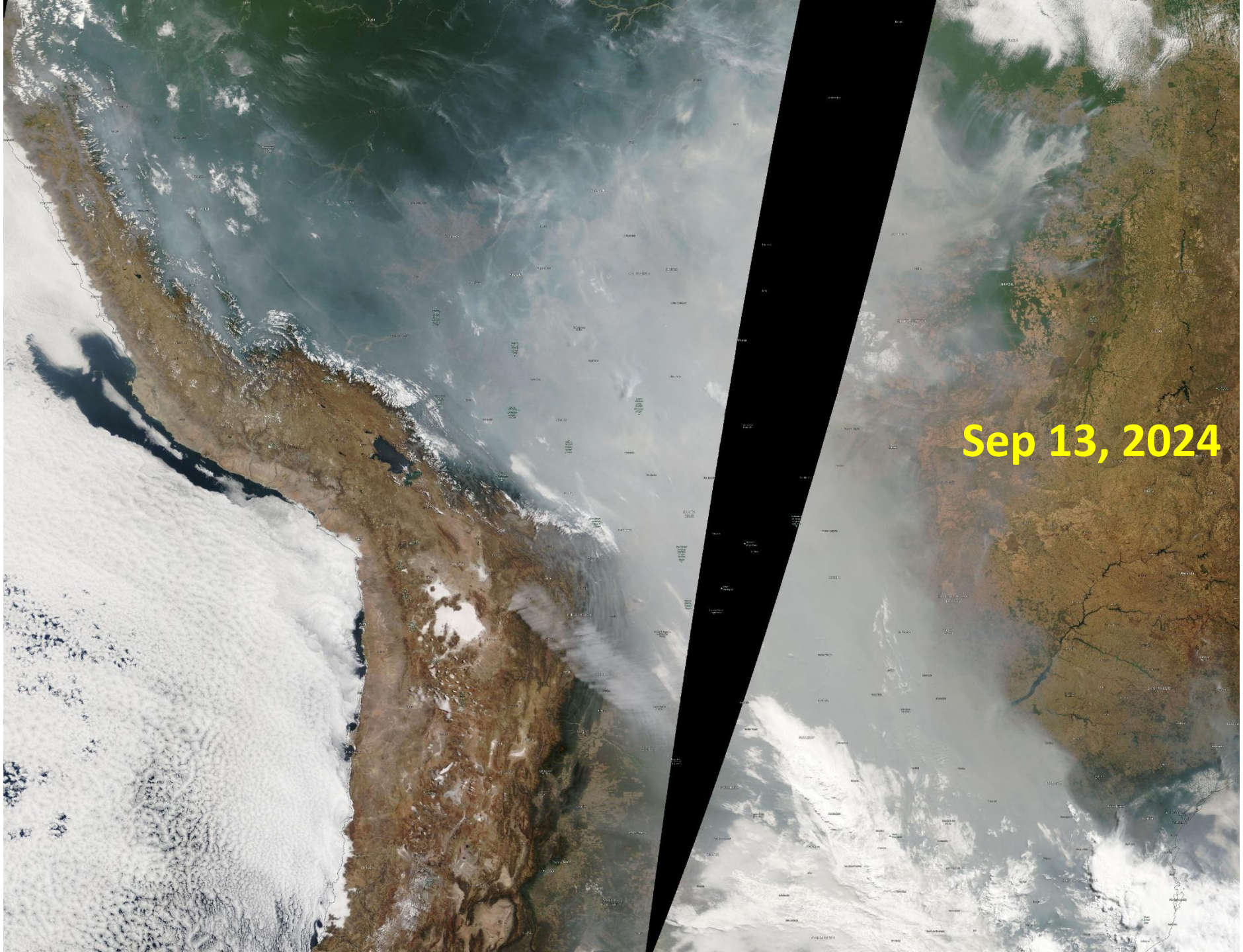
Conclusions – cont.

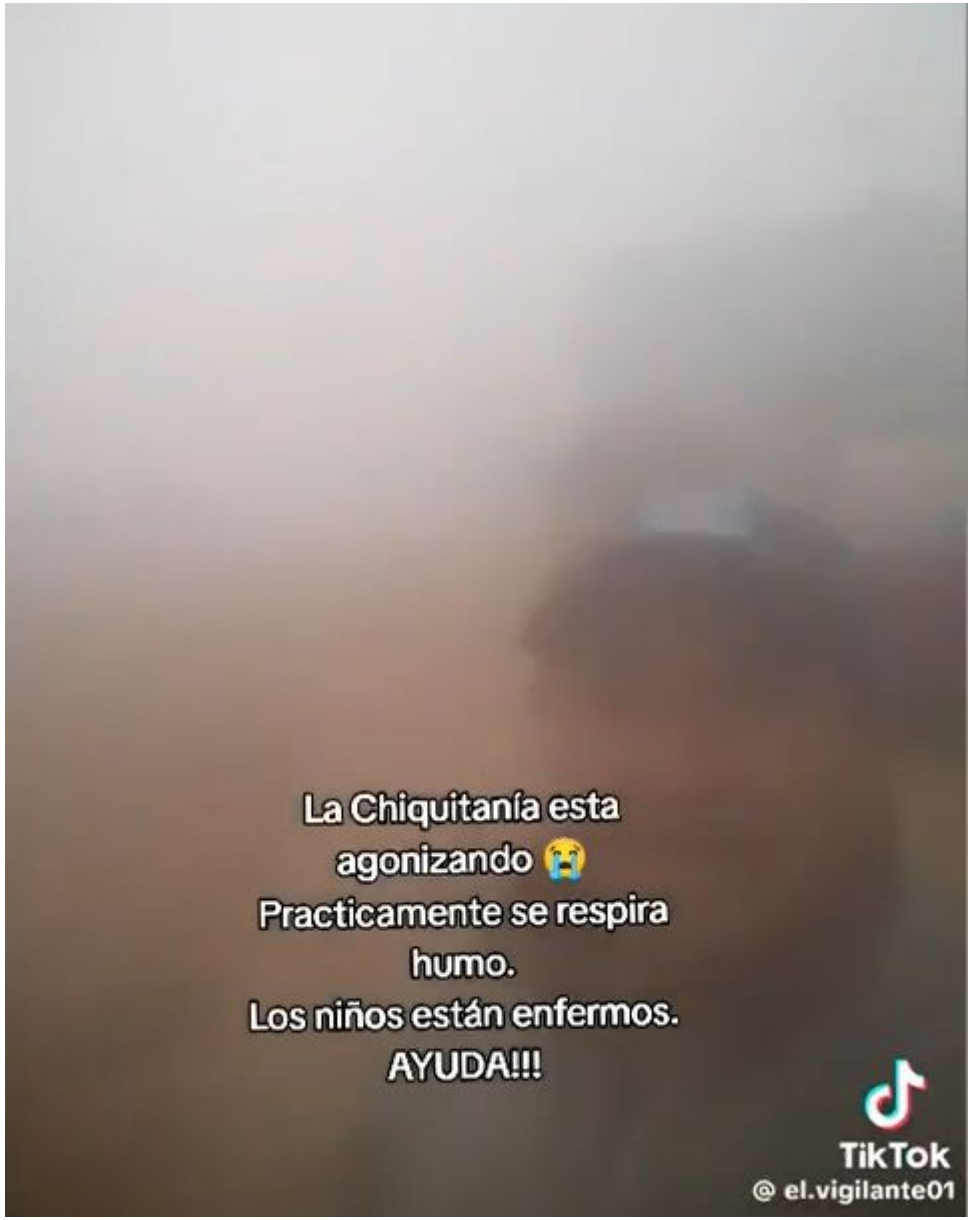
- EAE from the sunphotometers suggests that during clean conditions, typically with westerly winds, coarse aerosols are present, in this case dust from the Altiplano region.
- During the period of highest pollution, EAE suggest the presence of aerosols produced by biomass burning.
- This is supported by the two aethalometers in the region. With the instrument at highest altitude showing a clearer signal of biomass burning aerosols than the instrument in the urban environment, where other types of aerosols are present.
- PSVD retrieved by the sunphotometer in La Paz shows a clear change in the bimodal distribution, with an increase in the fine mode during the polluted period.
- A mobility particle sizer located at CHC clearly captures this increase in the surface.

Thank you!

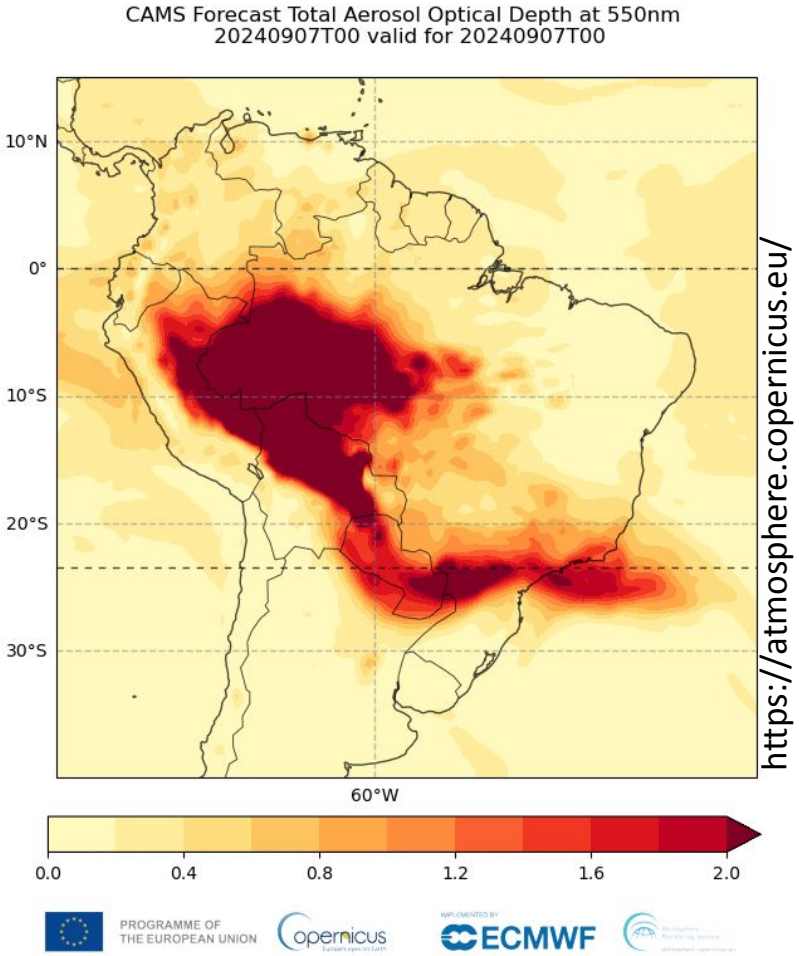
Credit: Fernando Velarde

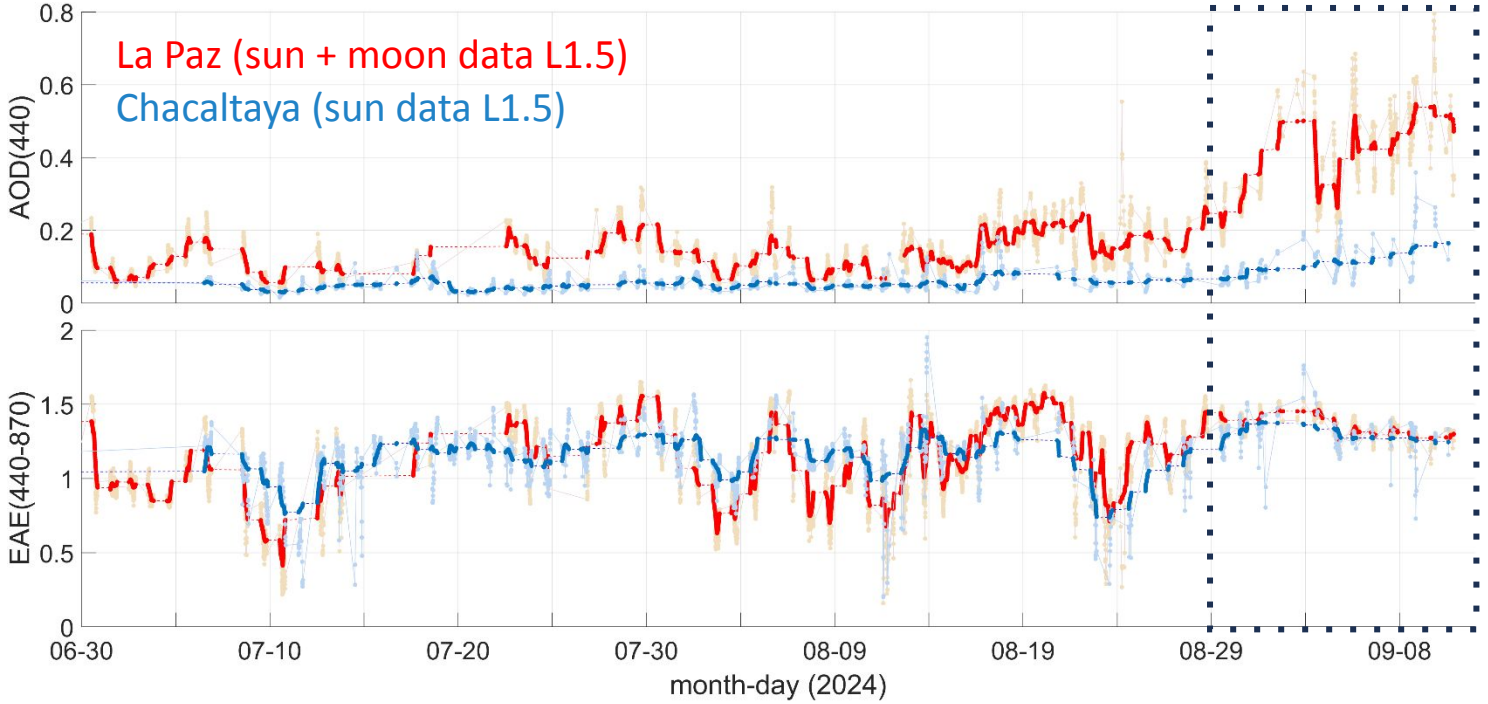
Credit: Manuel Roca

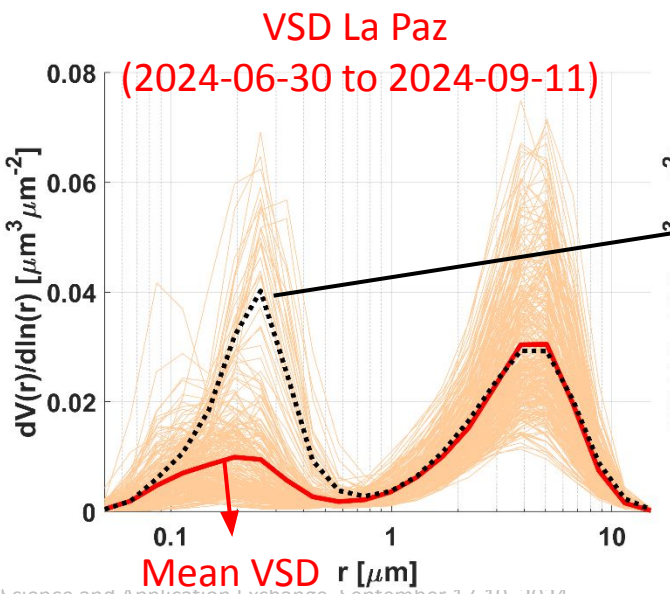

Sep 13, 2024

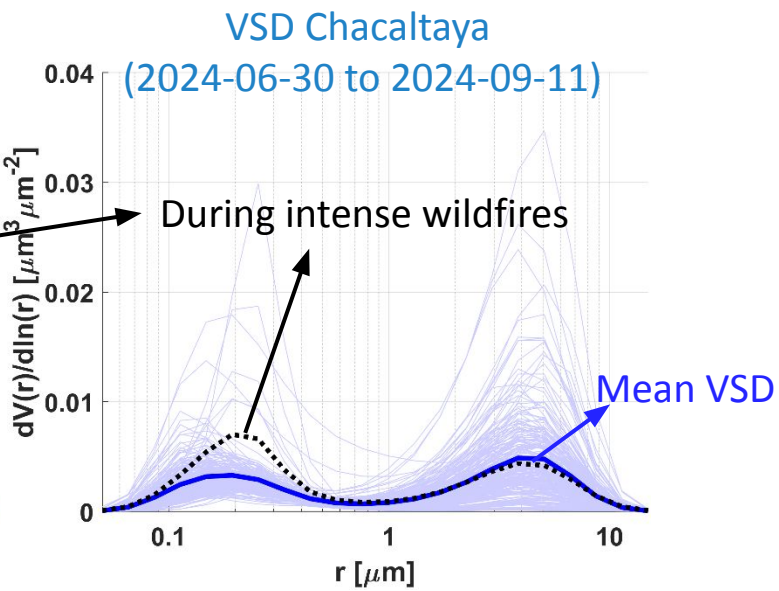


Chochís, Chiquitanía

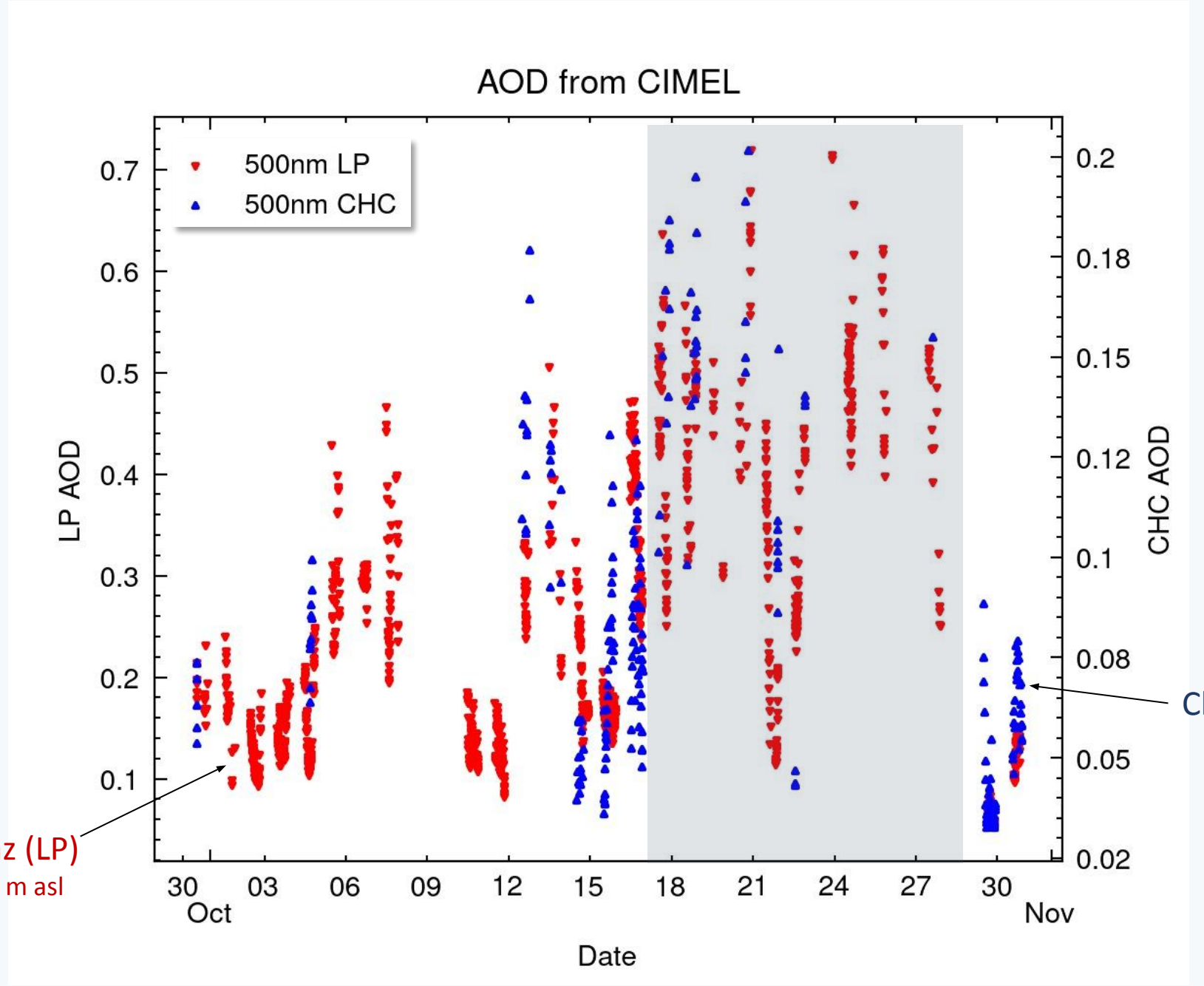








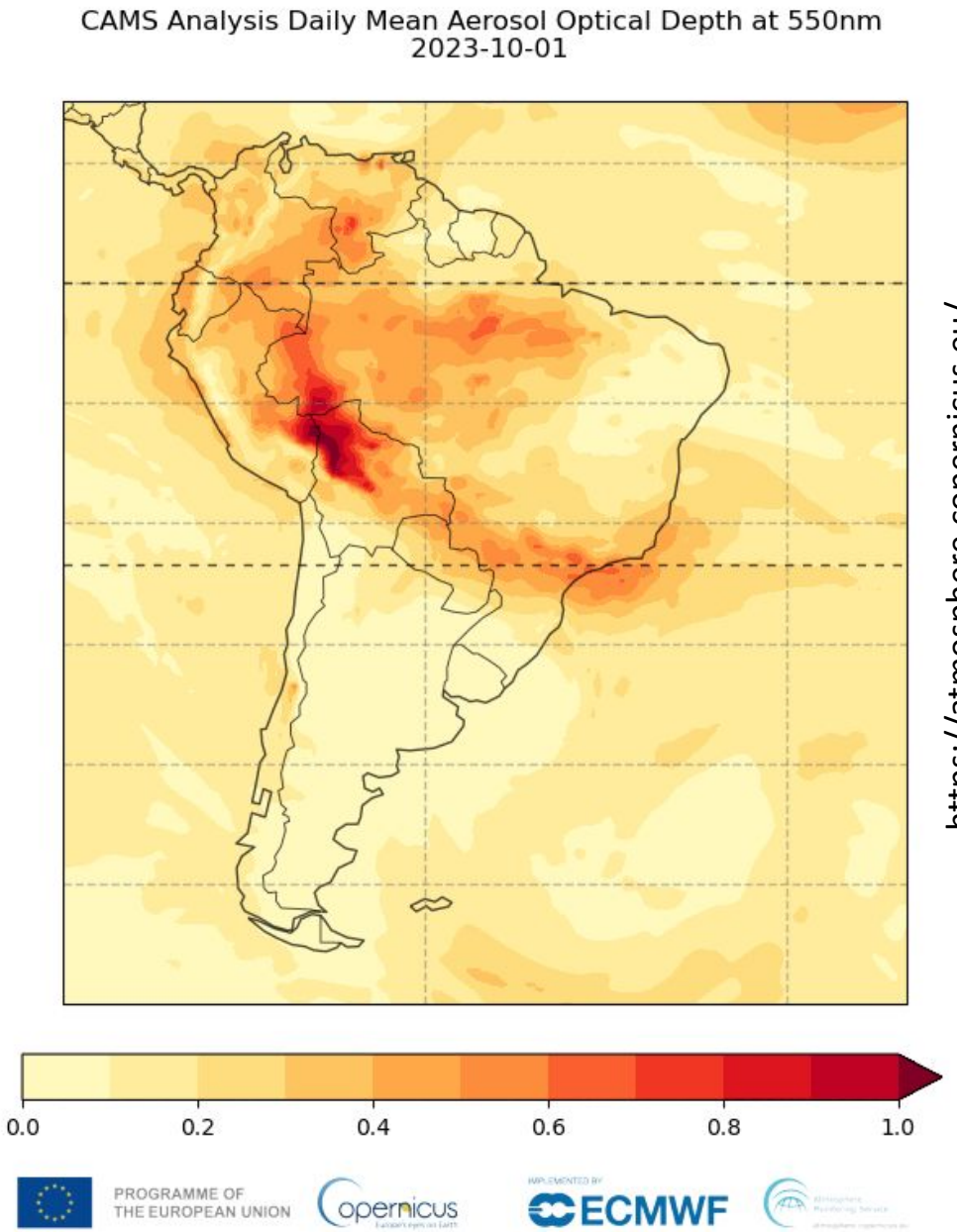
Prepared by Maria Fernanda Sanchez



La Paz (LP)
3420 m asl

Chacaltaya (CHC)
5240 m asl

October, 2023



https://atmosphere.copernicus.eu/

Chacaltaya (CHC)