Analyzing The Effects Of Biomass Burning In The Amazon Region On The São Paulo Urban Boundary Layer

***G. A. Moreira*[1,2,3], *F. J. S. Lopes*[3,4], *G. Codato*[2], *M. P. Sánchez*[2], *J. J. Silva da Silva*[3,5], *A. A. Gomes*[3], *J. V. Tito*[2], *L. A. H. Silva*[5], *L. C. Silveira*[6], *E. Landulfo*[3] *And A. P. Oliveira*[2]**

(1) Federal Institute of São Paulo - IFSP, Av. Clara Gainotti de Souza, Registro, Brazil, gregori.moreira@ifsp.edu.br

(2) University of São Paulo – USP, Institute of Astronomy, Geophysics and Atmospheric Science, Rua do Matão 1226, São Paulo, Brazil

(3) Institute of Research and Nuclear Energy - IPEN, Center of Lasers and Applications, Av. Prof. Lineu Prestes 2242, São Paulo, Brazil

(4) Federal University of São Paulo – UNIFESP, Department of Environmental Sciences, Institute of Environmental, Chemical and Pharmaceutical Sciences, Rua São Nicolau 210, Diadema, Brazil

(5) Federal University of Western Bahia - UFOB, Center of Exact Sciences and Technologies – CCET, Rua Bertioga 892, Barreiras, Brazil

(6) University of São Paulo – USP, Institute of Energy and Environment, Av. Prof. Luciano Gualberto 1289, São Paulo, Brazil

Episodes of biomass burning in the Brazilian Midwest and Amazon region have increased sharply in the last years (Barkhodarian et al., 2019). Although there is information about the transport of this kind of aerosol to other regions during the Brazilian winter and spring (Lopes et al., 2003), there is no detailed analysis of the impact of them on neighbor regions. In this paper, we present an analysis about as the Amazon biomass burning episode can influence the behavior of the urban boundary layer (*UBL*) in the São Paulo city.

This study carried on in August 2019 during a measurement campaign performed at São Paulo state Treasure Office - SEFAZ (-23º 54” S, -46º 63” W, 722 m a.s.l), which is situated in the center of the São Paulo city. Continuous measurements were performed by MSP Lidar 2, which is a mobile biaxial ground-based multiwavelength Raman lidar system. It operates with a pulsed Nd:YAG laser, pointing to zenith direction, on a repetition rate of 20 Hz with one elastic channel (532 nm) and one Raman-shifted channel (667 nm). The MSP Lidar 2 full overlap is reached around 180 m, and its temporal and spatial resolutions are 2 s and 7.5 m, respectively. In reason of high-frequency data acquisition was possible to perform an analysis of high order statistical moments, which can provide us information about the *UBL* height, vertical movements of aerosol plumes and their level of mixing (de Arruda-Moreira et al., 2019).

Figure 1-A presents the Range Corrected Signal (*RCS*) profile obtained on 18th August 2019. Although there is a presence of a strong residual layer during the dawn and early morning, it is possible to observe the appearance of a decoupled aerosol layer, around 06:00 Local Time (LT), situated between 1000 and 2500 m. From the radiosonde data (Fig 1 – B) it is possible to observe the separation between the ascending convective boundary layer (around 400 m) and the aerosol decoupled layer. In addition, the horizontal wind speed profile has high values in the region of aerosol layer, suggesting that it was advected from another region. Such an idea is reinforced by the backward trajectories (Fig. 1-C), generated from Hysplit (Stein et al., 2015), which demonstrate the transport of aerosol from Amazon region (where occurred an event of biomass burning on 15th August) to São Paulo city. The variance profiles (Fig. 1 – D) provide the position of *CBL* height (maximum peak) and the top of the aerosol layer (secondary peaks), enabling to observe the vertical movement of these layers, which are separated between 03:00 and 04:00 UTC, become a single layer between 11:00 and 12:00 UTC, resulting in a very concentrated aerosol layer around 1100 m between 19:00 and 21:00 UTC.

The results obtained from this study demonstrate as biomass burning events can influence the atmosphere of other regions. In addition, the proposed methodology enabled us to observe as occur the mixing between a decoupled aerosol layer and the *CBL*, so that this process can influence significantly the air quality in reason of transport of particulate material.

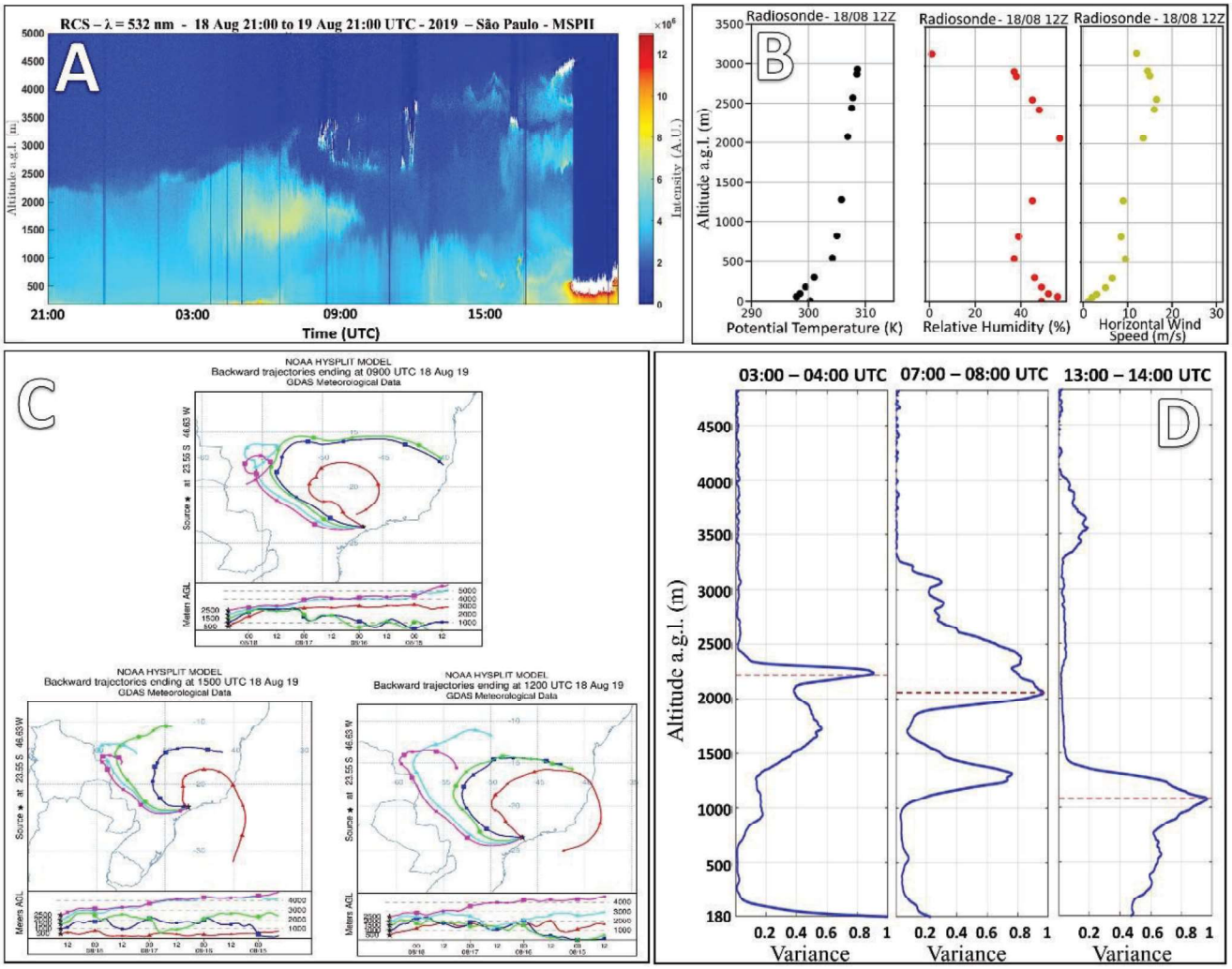

Figure 1. (A) Time evolution of lidar Range Corrected Signal (RCS) at 532 nm. (B) Potential Temperature, Relative Humidity and Horizontal Wind Speed Profiles. (C) Backward Trajectories generated by Hysplit. (D) Profiles of RCS Variance, the dotted red line represents the maximum of the profile.

Acknowledgements

The authors would like to acknowledge the financial support from FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo) by the project numbers 2018/06720-9 and 2015/12793-0

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