TRANSBOUNDARY AIR POLLUTION IN SOUTHERN AMAZON OF PERU

L. Suarez [1,2 *] ,K. Jeremias[2], J Quincho[2], J. Tovar[2] and R. Guillermo[2]

1. School of Environmental Engineering, Universidad Alas Peruanas en Huancayo, Junin, Peru
2. Forest and Environmental Sciences, National University of the Center of Peru, Huancayo, Peru

* Corresponding author: doctorozono@yahoo.com

ABSTRACT

Biomass burning is the main source of pollution in the tropical region, covering huge areas in Amazon basin. Special concern exists in the border of Peru, Bolivia and Brazil where big land areas area cleared and burned every year, as part of an increase of agriculture areas for commercial crops. The pollutants resulting from this burning could travel thousands of kilometers, mainly, the related to burning in the region of Brazil, where more fire activity is identified, and that could be transported by the predominant winds to the Peruvian territory. This work summarizes the findings and discussions about this aspect during intensive campaigns performed for collecting aerosols. We implemented three locations for monitoring: Oxapampa, Mazamari and Manu, covering the southern part of the Peruvian Amazon. Satellite information was used for complement monitoring of aerosols and tropospheric ozone. Ground measurements collected aerosols for later evaluation of the elemental chemical composition. Finally, we used HYSPLIT model to evaluate trajectories of air pollutants to identify sources of pollution. During the sampling campaign it was possible to detect the seasonal variation of aerosol and tropospheric ozone over the Amazon basin of Peru, Bolivia and Peru. There was a strong modification of elemental concentration mainly related to biomass burning tracers like P and K, and also related to crustal Ca and Si. The combined use MODIS and CALIPSO satellites provide a deeper understanding of the aerosol content in the atmosphere. Special attention was done for pollution during September 17th 2008, the day with the highest value for Aerosol Optical Depth of MODIS (0,741).

IMPORTANCE

What is the importance of the transport of air pollutants (aerosols and tropospheric ozone) from biomass burning to the Andean and Amazonia region in Peru?

Is it an air quality or climatic issue?

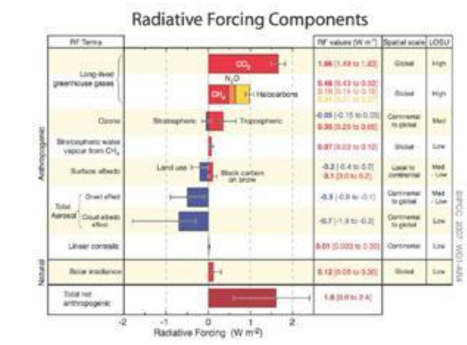

Fig. 1. Fire pixels from NOAA satellites for 2000 to 2008 (from DSA/INPE) over Peru, Brazil and Bolivia. There is an important amount of pollution produced by biomass burning mainly in Brazil. Note the logarithmic scale of Y axis.

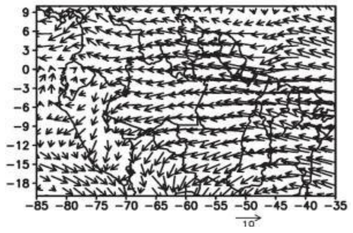

Fig. 2. Field winds at 700 HPa of global analysis (NCEP-NCAR)

It show the special prevalence of winds coming from east to west region of the Amazonia creating special conditions for transporting different pollutants.

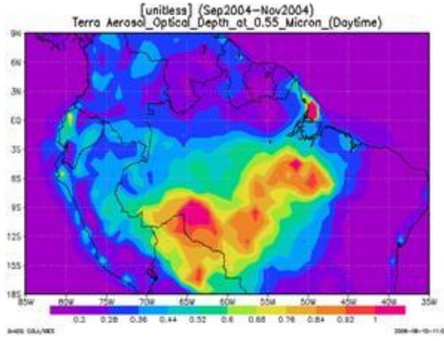

Fig. 3. Spatial variation of aerosol optical depth by MODIS sensor where is possible to note that aerosol over Peru is influenced by pollution coming from Brazil.

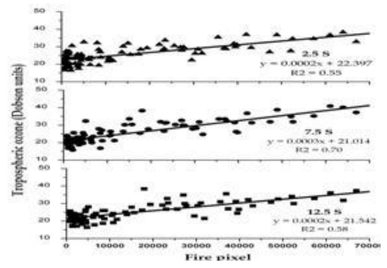

Fig. 4. Latitudinal variation of tropospheric ozone over the Andean and Amazonia of Peru at 72.5 W

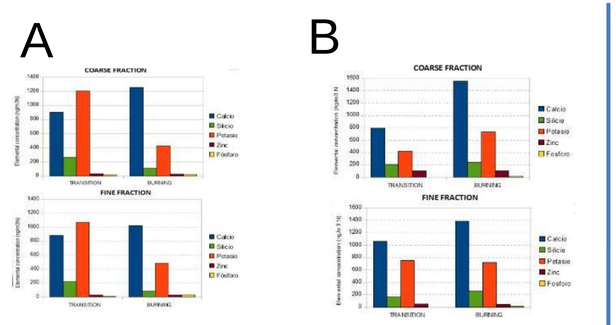

Fig. 5. Comparison of the results between transition (August and September) and burning (October and November) period for fine and coarse fraction of aerosols at Mazamari (A) and Manu (B) locations during fieldwork in 2008.

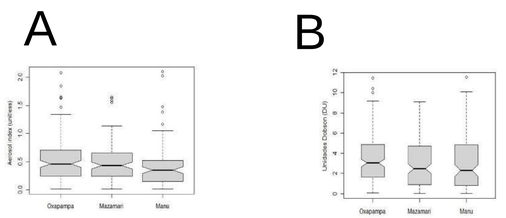

Fig. 6. Measurements of tropospheric ozone **(A)** and aerosol (as aerosol index) **(B)** and for the three locations done by the OMI satellite during the last 6 months of 2008.

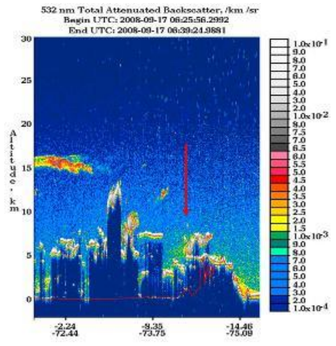

Fig. 7. Vertical variation of light dispersion in the atmosphere related to different elements (mainly low and high cloud and aerosols). The red arrow indicates pass over the study area during September 17th 2008, the day that has the highest value for AOD of MODIS (0,741).

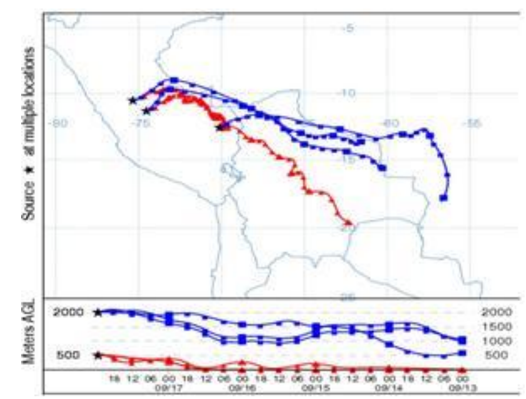

Fig. 8. Air masses trajectories for 5 days before Sep. 17th 2008 for the 3 locations used in the study the transport of pollutants from Brazil and Bolivia to Peru. Lower box shows altitude variations of air masses.

CONCLUSIONS

- It was possible to detect the seasonal and spatial variation of aerosol and tropospheric ozone over the Amazon basin of Peru, Bolivia and Peru.
- There is a strong modification of elemental concentration of aerosols mainly related to biomass burning tracers like P and K, and also related to crustal Ca and Si. There were contrasting results but increases of P and K of about 50% were detected.
- It was complemented the measurements with other satellites that could provide a deeper understanding of the aerosol content in the atmosphere: MODIS and CALIPSO. It was possible to detect the seasonal variation and peak days with high values of aerosols. Further improvements will be needed to take maximum advantage of this data and also make corrections due to clouds interferences. Air masses trajectories were performed using HYSPLIT in order to gain knowledge about the sources and origin.

ACKOWLEDGEMENTS: