

IMPACT OF TRANSBOUNDARY BIOMASS BURNING POLLUTION TRANSPORT OVER CENTRAL ANDES OF PERU

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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 are 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 Andean and Amazon Peruvian territories.

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?

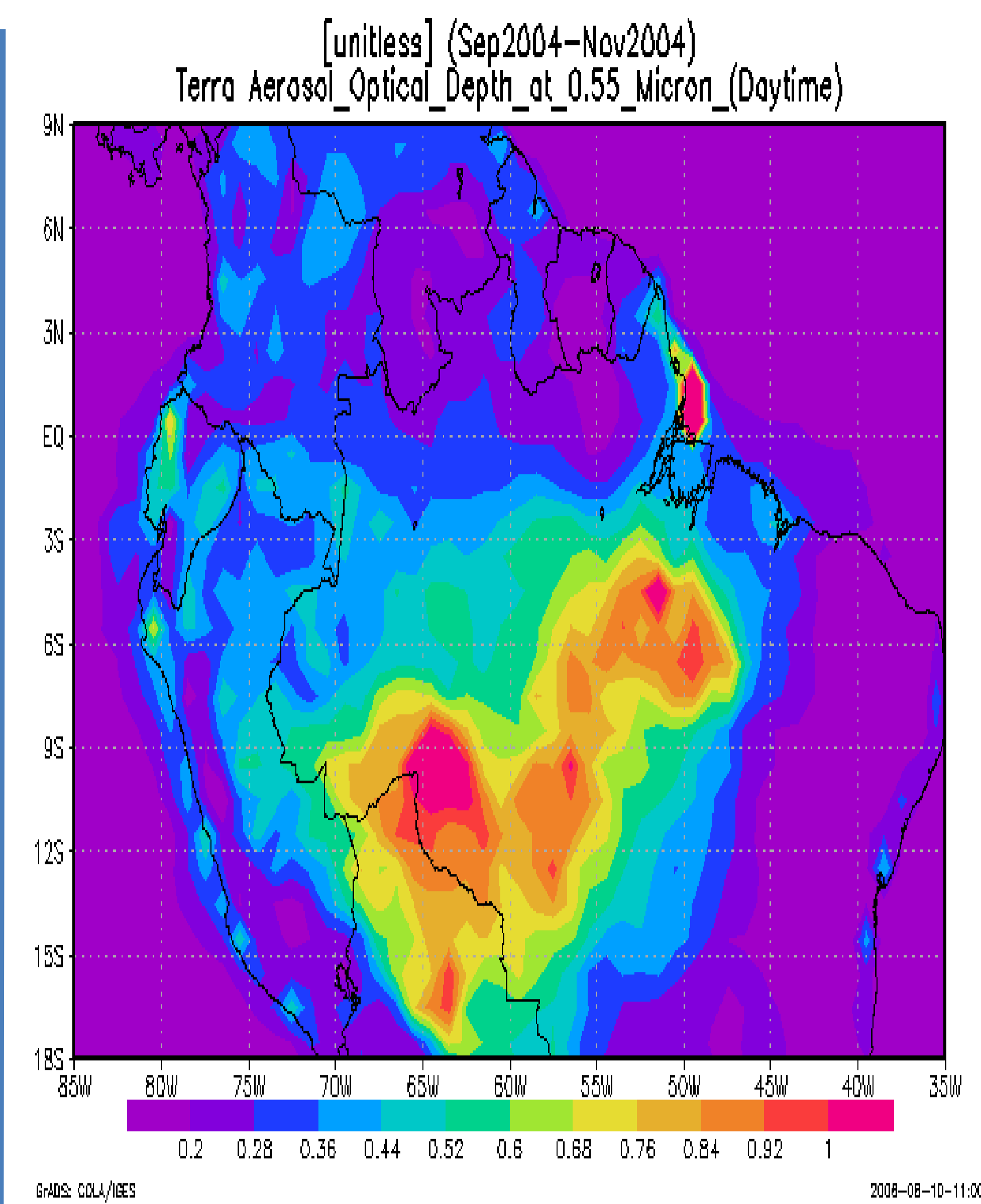
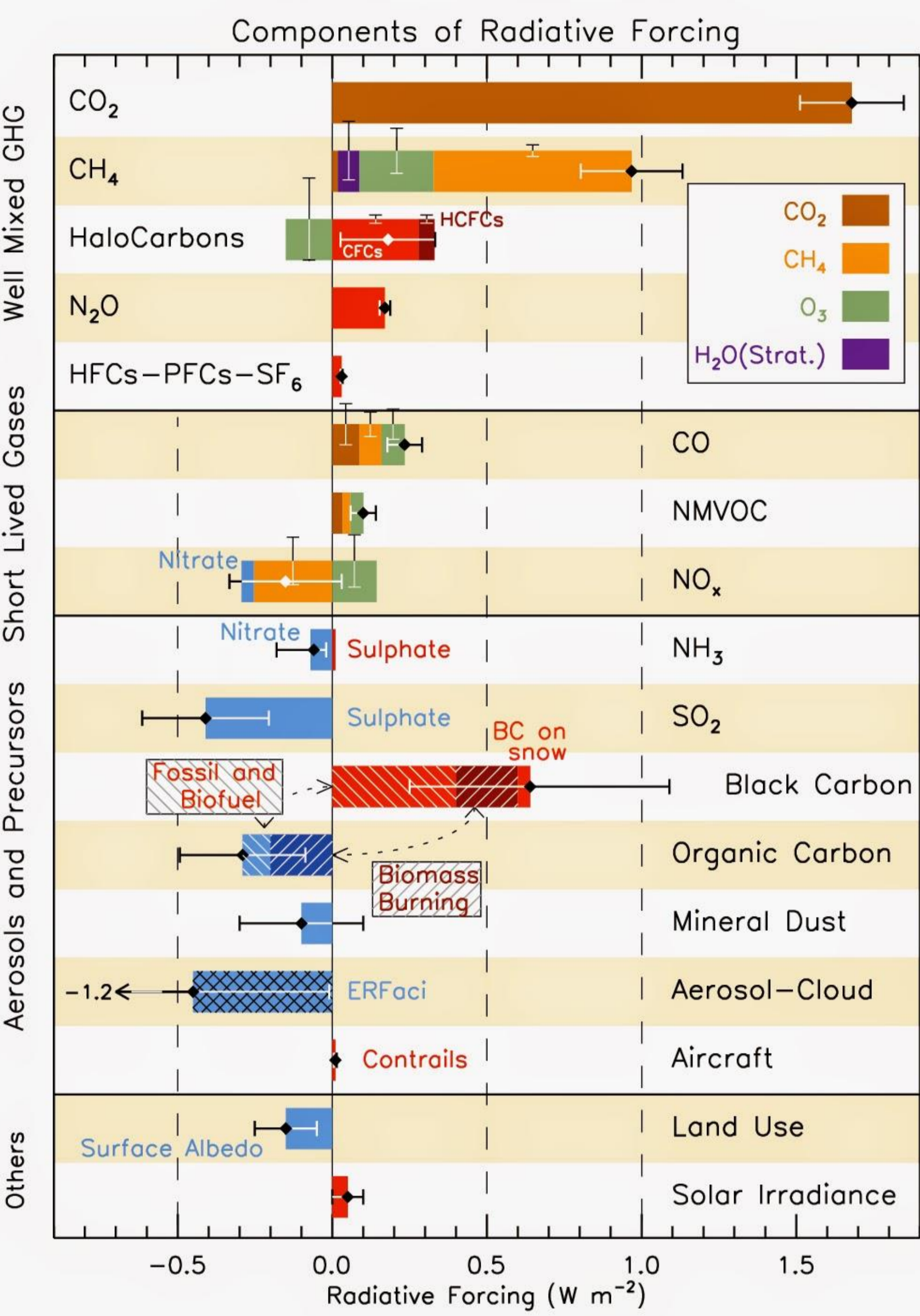


Fig. 3. Spatial variation of aerosol optical depth by MODIS sensor where is possible to note that aerosol over Peru is influenced by pollution coming from Brazil.

IMPROVING AIR POLLUTION DETECTION

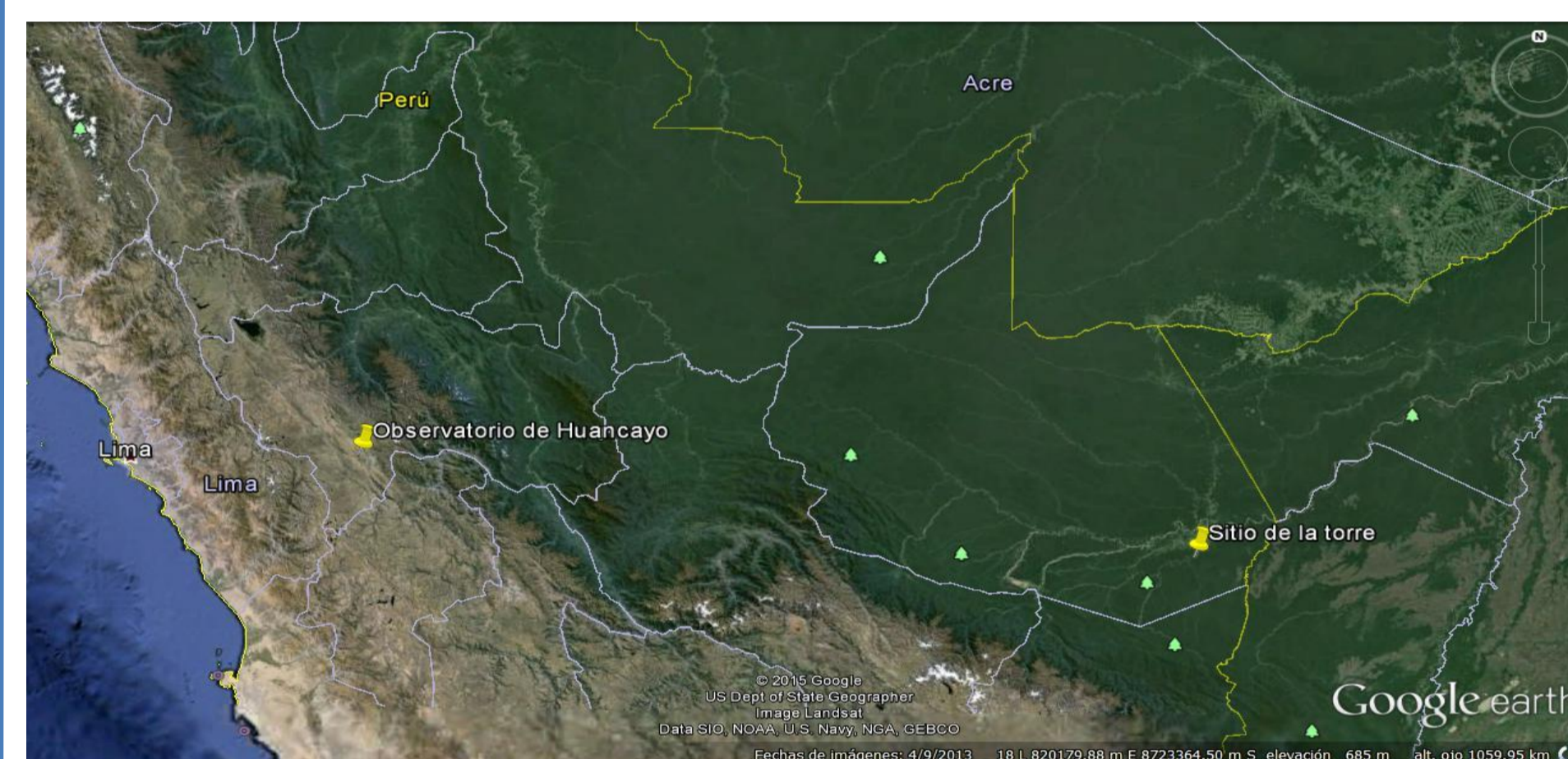


Fig. 4. Measurement sites over the Andean and Amazonia of Peru where there is an increase of monitoring and research capabilities.



Fig. 5. Implementation of a tropospheric ozone monitoring station at the Andean site (Observatory of Huancayo, Geophysical Institute of Peru) with the support of our US Partner Dr. Detlev Helmig (April 2014)

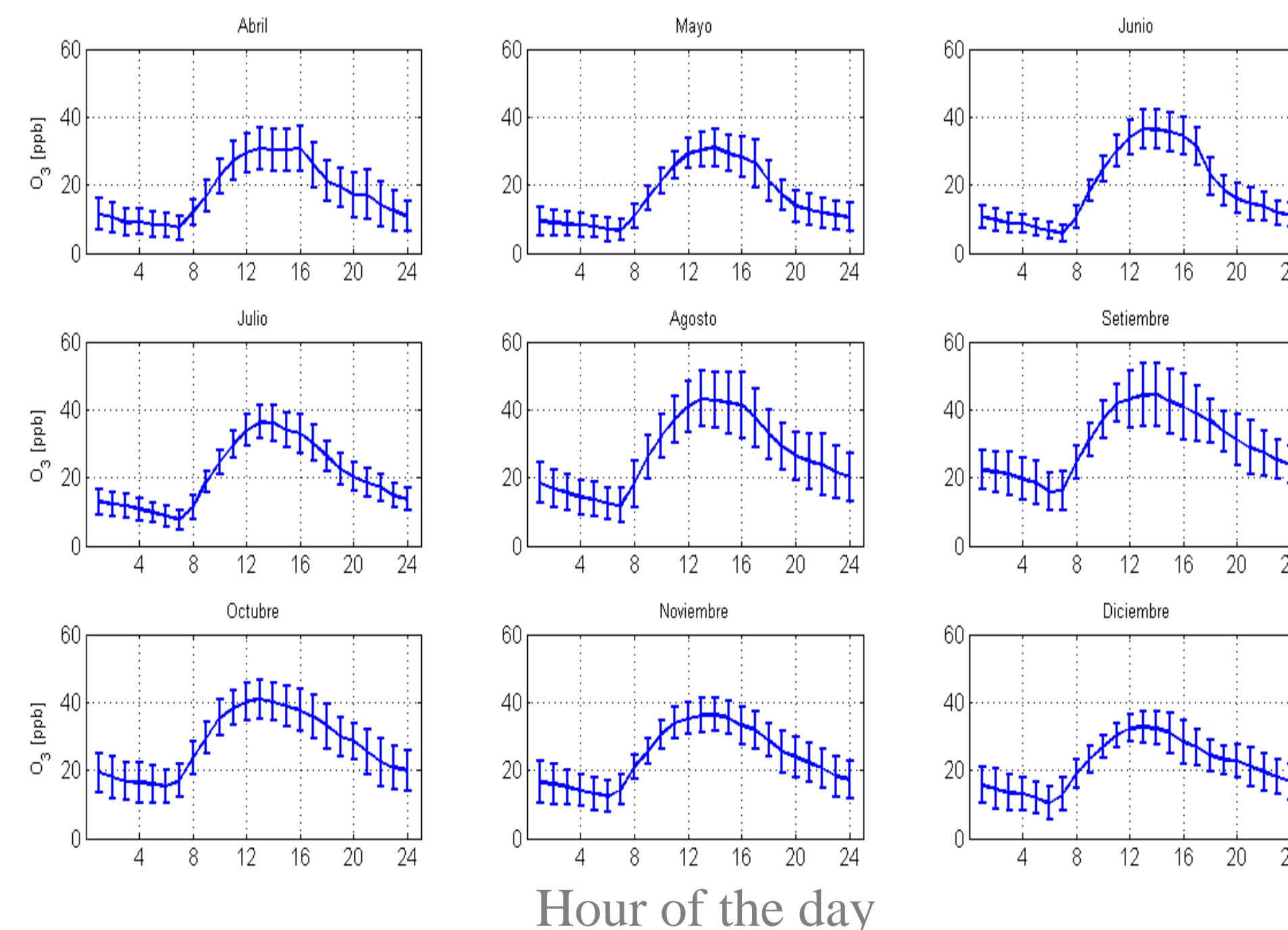


Fig. 6. Hourly variation of the 9 first months (April to December 2014) of tropospheric ozone measurements at the Observatory of Huancayo. It is possible to note the highest values during the dry season (from August to October) where most fire are registered too. Some hours exceeds the daily Peruvian Air Quality Standard for ozone (about 60 ppb)

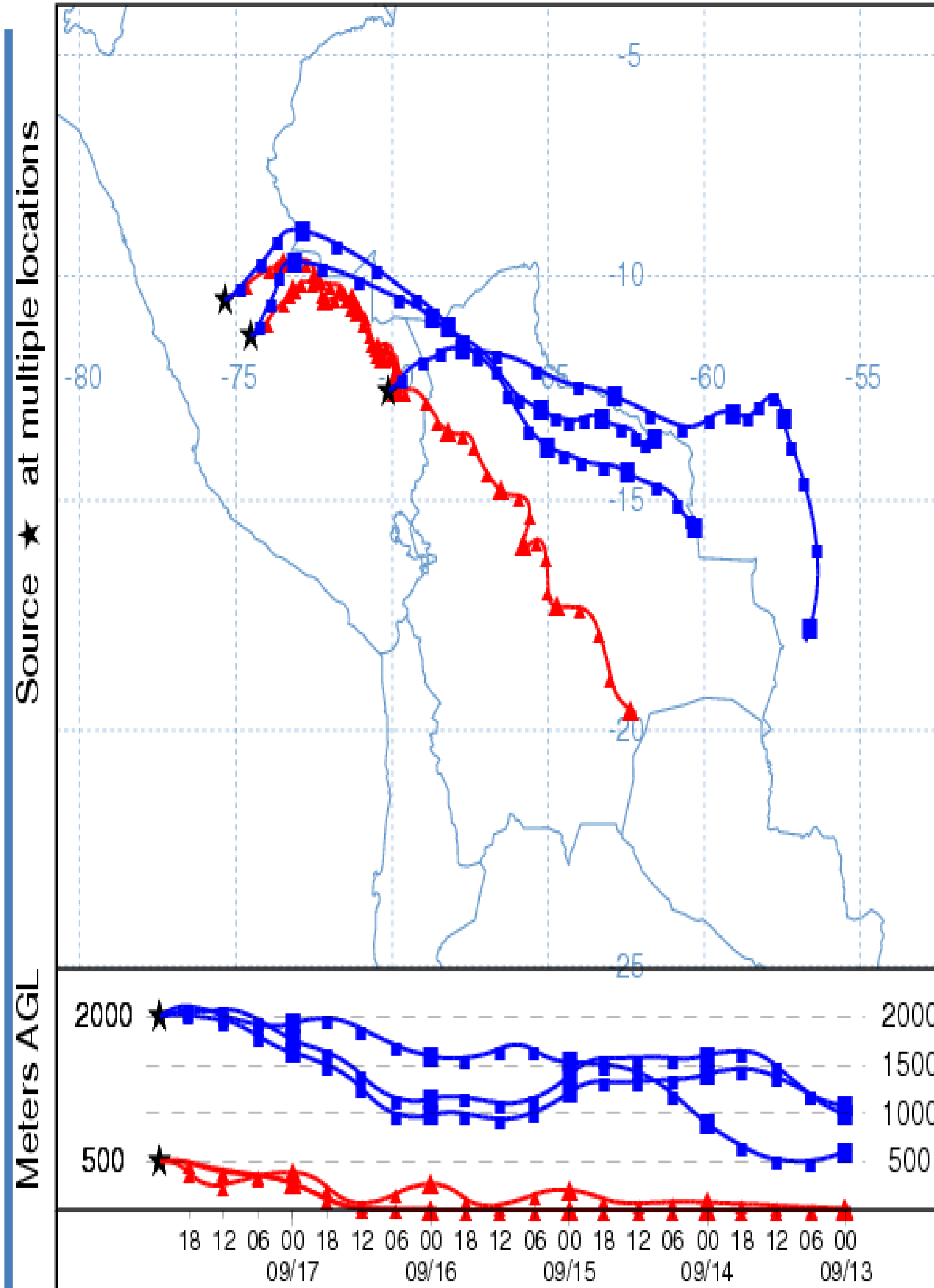


Fig. 7. Air masses trajectories for 5 days before Sep. 17th 2008 for the 3 locations used in the study the transport of pollutants from Brazil and Bolivia to Peru. Lower box shows altitude variations of air masses.



Fig. 8. Additionally to the use of models and satellite data, with support of our US Partner, we are implementing an aerosol and tropospheric ozone monitoring system to be installed at a tower facility of 45 m of altitude, in the forest close to the borders of Bolivia and Brazil where most fires are produced.

INCREASING HUMAN RESOURCES FOR ATMOSPHERIC RESEARCH



Fig. 9. Support to graduate and undergraduate students for doing their thesis. With additional support from researchers from Brazil and USA.



Fig. 10. Implementation of the office facilities of the Laboratory of Atmospheric Microphysics and Radiation (LAMAR) at the Observatory of Huancayo.

ADDITIONAL IMPORTANT INTERACTIONS



Fig. 11. During the visit of Dr. Charles F. Bolden, NASA's administrator, I was able to have a specific conversation about this research and to complement the research and monitoring with NASA's support in order to have a high level atmospheric research facility for the Andean Region.



Fig. 7. Also, with this work developed about atmospheric monitoring it was possible to complete the agreement with the prestigious AERONET network for NASA. A sun photometer was deployed at the Observatory of Huancayo by March, 20th, 2015 with the visit of Jon Rodriguez. Data is already sent to NASA's servers for processing to study the optical and radiative properties of atmospheric aerosols.

SUMMARY OF ACTIONS

- It was possible to have an adequate advance in the development of the research project,
- It was possible to increase research capabilities, as human resources and instrumentation.
- The project fostered other institutional cooperation agreements like AERONET/NASA or universities (for tower site facilities).
- Initial contacts have been performed with local, regional and national authorities about our support on air quality management in Huancayo city.
- We expect to promote the implementation of a national high level atmospheric research facility based on this actions.

THIS WORK IS FUNDED BY:

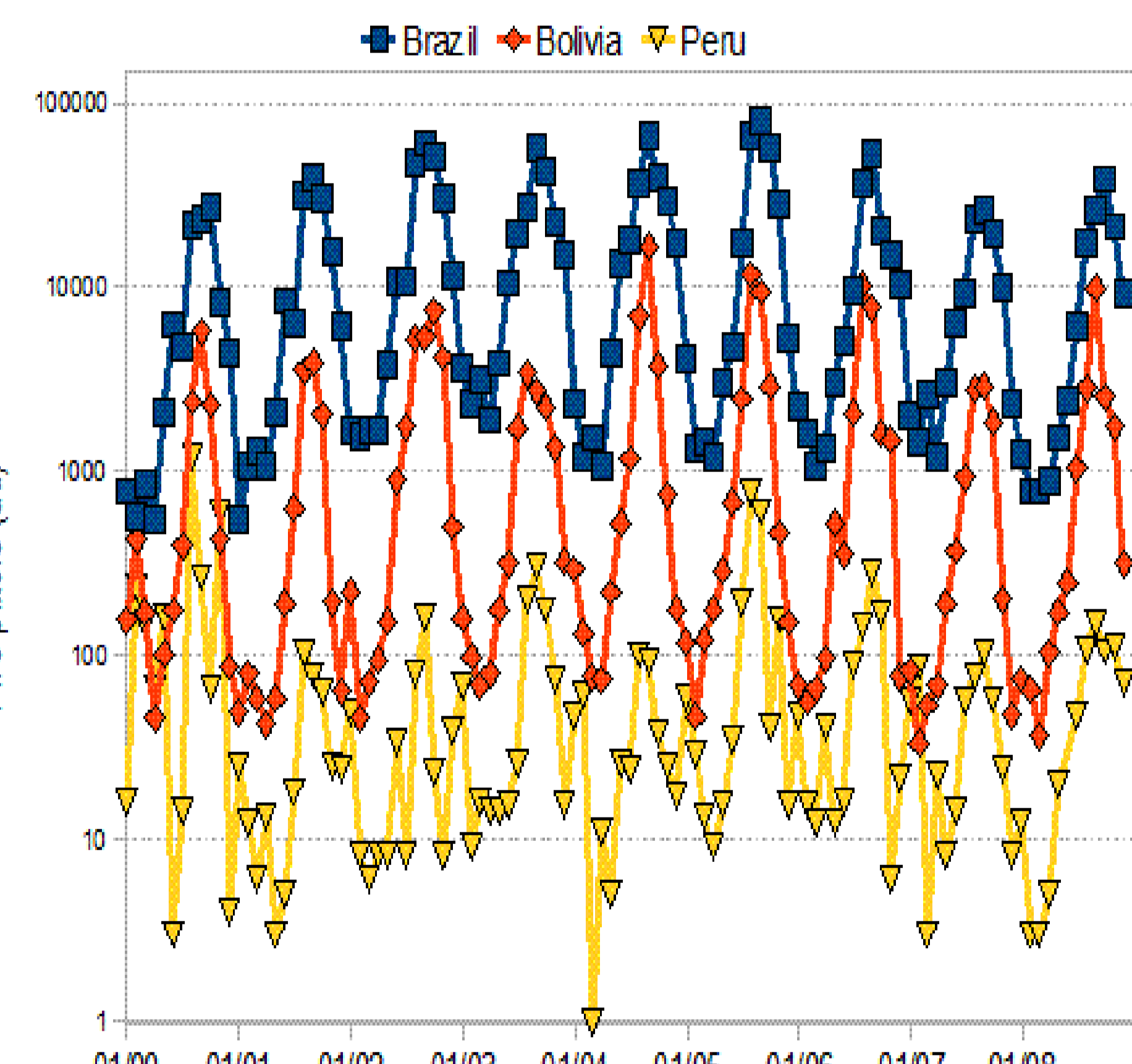


Fig. 1. Fire pixels from NOAA satellites for 2000 to 2008 (from DSA/INPE) over Peru, Brazil and Bolivia.

Important amount of pollution is produced by biomass burning mainly in Brazil. Note the logarithmic scale of Y axis.

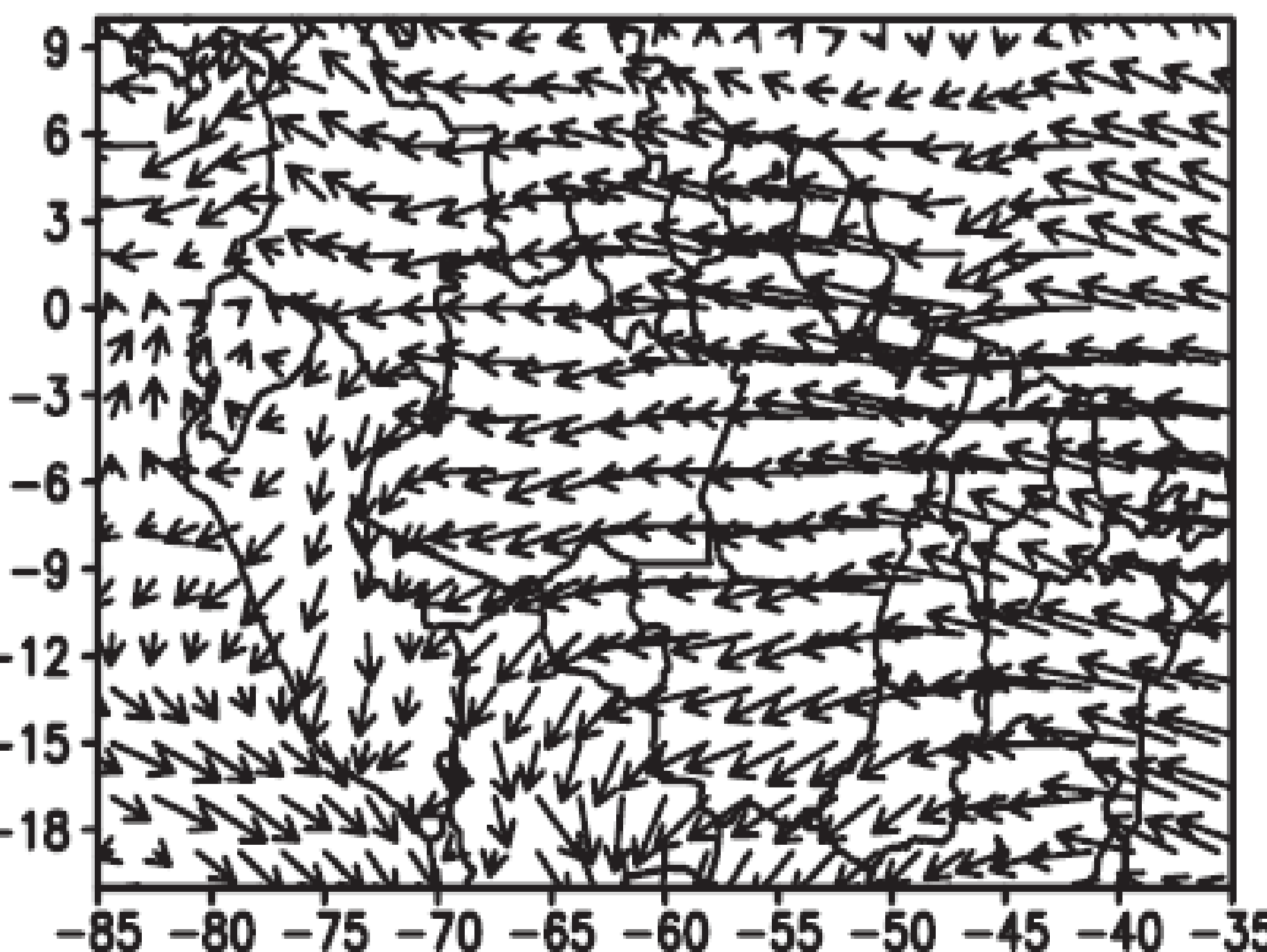


Fig. 2. Field winds at 700 hPa of global analysis (NCEP-NCAR) It shows the special prevalence of winds coming from east to west region of the Amazonia creating special conditions for the transport of different pollutants.