

3.030 Emissions of NO_x, SO_x, and PM from stationary combustion sources in Brazil: Spatial distribution and population exposure assessment.

Presenting Author:

Jorge Martins, Department of Physics, Federal University of Technology – Parana, Londrina, PR, Brazil, jmartinseae@gmail.com

Co-Authors:

Ana Beatriz Kawashima, aLaboratory of Extreme Weather Events, Federal University of Technology – Parana, Londrina, PR, Brazil

Sameh A. A. Rafee, cDepartment of Atmospheric Sciences, University of São Paulo, São Paulo, SP, Brazil

Mauricio N. Capucim, Laboratory of Extreme Weather Events, Federal University of Technology – Parana, Londrina, PR, Brazil

Marcos V. B. Moraes, Laboratory of Extreme Weather Events, Federal University of Technology – Parana, Londrina, PR, Brazil

Viviana U. Guerrero, Laboratory of Extreme Weather Events, Federal University of Technology – Parana, Londrina, PR, Brazil

Veronika S. Brand, Laboratory of Extreme Weather Events, Federal University of Technology – Parana, Londrina, PR, Brazil

Edmilson D. Freitas, Department of Atmospheric Sciences, University of São Paulo, São Paulo, SP, Brazil

Maria F. Andrade, Department of Atmospheric Sciences, University of São Paulo, São Paulo, SP, Brazil

Taciana T. A. Albuquerque, Federal University of Minas Gerais, Belo Horizonte, MG, Brasil

Rodrigo A. F. Souza, Amazonas State University, Manaus, AM, Brazil

Leila D. Martins, Department of Chemistry, Federal University of Technology – Parana, Londrina, PR, Brazil

Abstract:

The emissions and the spatial distribution of the major stationary sources of NO_x, SO_x, and PM in Brazil were estimated in this work. A total of 16 refineries, 96 cement industries, 64 pulp and paper industries and 1730 thermo power plants (natural gas, sugarcane bagasse, residual fuel oil, diesel oil and coal) were included in the inventory. The emissions were calculated based on emission factors (EF) within a range varying from lower to higher limits proposed by the AP-42 standards of the US Environmental Protection Agency. The estimates were 857±415 Gg/year for NO_x, 1,51±1,23 Tg/year for SO_x, and 10,4±10,1 Tg/year for PM. Refineries, cement industries and diesel power plants are the dominating sectors for NO_x emissions, with 28% (26), 39% (24), and 21% (36), respectively, considering lower(higher) EF. Refineries dominate the emission of SO_x (42%), followed by diesel (18%), fuel oil (18%), Coal 15%, and Cement (8%) under lower

EF. At higher EF refineries emitted 44%, followed by coal power plants (33%) and cement industries (15%). In terms of PM, under lower EF limits, coal power plants represent 65% of emissions, followed by refineries (21%). On the other hand, at higher EF limits, the cement industry sector dominates, with 78%, followed by coal power plants with only 11%. Comparing the emissions by stationary sources, estimated by intermediate values of EF, with the vehicular emissions, estimated by the Brazilian Ministry of the Environment (MMA), emissions of NO_x are slightly lower than vehicular, while the emissions of SO_x and PM are 300 times higher than vehicular. The contribution of stationary sources are still significant, even if lower limits of EF are assumed. The spatial analysis indicates that, although most of attention is being given to vehicle emissions, a significant fraction of Brazilians is exposed to pollutants emitted by stationary sources.