



## The Environmental Health Information System - SISAM INPE-MS/OPAS

Alessandro Ferraz Palmeira\*, Jurandir Ventura Rodrigues, Vinicius Matoso Silva, Willian D. M. Rosa,  
Jonatas Leon Simões, Alberto Setzer, Fabiano Morelli

**ABSTRACT** – Technological advances in computational tools and remote sensing techniques in recent decades have improved observations and analyses of atmospheric and terrestrial phenomena. An example of this evolution is INPE’s Wildfire Program (“*Programa Queimadas, Instituto Nacional de Pesquisas Espaciais*”), which includes the monitoring of active fires with satellites and the estimate and prediction of the vegetation fire risk, among other products. Its data indicate significant increases in the annual number of fires in the Brazilian territory along the years, varying from one hundred thousand to three hundred thousand fires, depending on the intensity of the drought, and considering only the data of the reference satellite. Vegetation fires emit gases and particles in the atmosphere that are harmful to human health and interfere with the thermodynamics of the atmosphere. In the southern and southeastern regions of Brazil a few networks monitor the impact of the emissions on air quality, such as in the metropolitan areas of Rio de Janeiro, São Paulo, Belo Horizonte and Porto Alegre. However, most of the Brazilian territory is not monitored, as in Amazonia. In order to supply information on concentrations of air pollutants for all regions of the country, INPE’s Wildfire Program developed a tool that provides meteorological data and satellite measurements (MODIS, VIIRS and OLCI sensors) of concentrations of air pollutants from fires and industrial/urban areas. It is an online platform with an integrated environmental information system for environmental health, called SISAM (“*Sistema de Informações Ambientais Integrado à Saúde Ambiental*”), [www.inpe.br/queimadas/sisam](http://www.inpe.br/queimadas/sisam). The web system uses open source technologies, such as the PostgreSQL database with PostGIS geospatial extension, Python programming language, Pandas and Xarray data libraries, the Elasticsearch and Kibana solutions for analysis and visualization, as well as satellite data and computational models; its output provides concentrations of particulate matter (PM<sub>2.5</sub>), O<sub>3</sub>, CO, NO<sub>2</sub>, SO<sub>2</sub> and active fires, as well as the meteorological variables of wind speed and direction, air relative humidity and temperature, and cumulative rainfall for all counties in Brazil, distributed in scales of daily, monthly or annual sets, following any user’s choice.

**Keywords:** Fires; emissions; pollution; gases; online platform