

MONITORAMENTO DE BIOAEROSSÓIS EM ESTAÇÃO DE TRATAMENTO DE ESGOTO

Luiz Vitor da Silva
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editora **IFC**

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A new strategy for risk assessment of PM_{2.5}-bound elements by considering the influence of wind regimes

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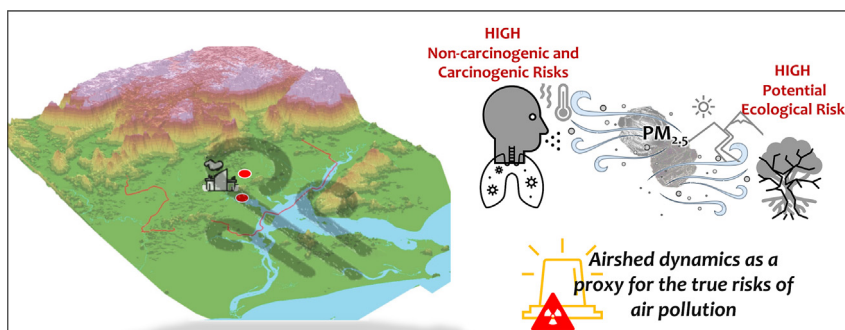
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HIGHLIGHTS

- Local environmental constraints modulate the impact of air pollution.
- A combined investigation of surface meteorological data and PM_{2.5} characterization.
- A holistic assessment of air pollution risks conditioned by the atmospheric dynamic.
- Assessing local airshed dynamics is crucial to safeguard ecosystems and human health.
- This new approach can be employed in any city's longer-term comprehensive plan.

GRAPHICAL ABSTRACT



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ABSTRACT

For regulatory purposes, air pollution has been reduced to management of air quality control regions (AQCR), by inventorying pollution sources and identifying the receptors significantly affected. However, beyond being source-dependent, particulate matter can be physically and chemically altered by factors and elements of climate during transport, as they act as local environmental constraints, indirectly modulating the adverse effects of particles on the environment and human health. This case study, at an industrial site in a Brazilian coastal city – Joinville, combines different methodologies to integrate atmospheric dynamics in a strategic risk assessment approach whereby the influence of different wind regimes on environmental and health risks of exposure to PM_{2.5}-bound elements, are analysed. Although Joinville AQCR has been prone to stagnation/recirculation events, distinctly different horizontal wind circulation patterns indicate two airsheds within the region. The two sampling sites mirrored these two conditions and as a result we report different PM_{2.5} mass concentrations, chemical profiles, geo-accumulation, and ecological and human health risks. In addition, feedback mechanisms between the airsheds seem to aggravate the air quality and its effects even under good ventilation conditions. Recognizably, the risks associated with Co, Pb, Cu, Ni, Mn, and Zn loadings were extremely high for the environment as well as being the main contributors to elevated non-carcinogenic risks.

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A fingerprint of source-specific health risk of PM_{2.5}-bound components over a coastal industrial city

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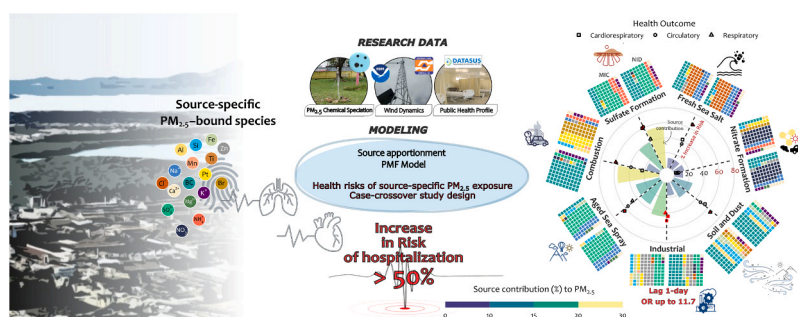
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HIGHLIGHTS

- Anthropogenic activities reallocate elements and chemically transform the atmosphere.
- Combined receptor modeling with logistic regression to analyze PM_{2.5} impacts.
- A case-crossover design to assess the health risks of source-specific PM_{2.5} exposure.
- PM_{2.5} from tainted natural sources is linked to increases in hospital admissions > 50 %.
- Place-based air quality policies are needed to tackle hazardous sources and hidden risks.

GRAPHICAL ABSTRACT



ARTICLE INFO

Keywords:

Air pollution exposure
Atmospheric chemistry
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ABSTRACT

The influence of specific local land-use activities (continuously redistributing elements across environments) and environmental conditions (altering the chemical composition of airborne particulate matter) on the intrinsic health risk of PM_{2.5} exposure is sparsely reported. To fill this gap, we employed a novel integrated approach to address the influence of short-term changes in source-specific PM_{2.5} composition on the exposure-response risk, while controlling for weather conditions. We combine receptor-based source apportionment with conditional logistic regression in a space-time-stratified case-crossover design. This approach is different from previous studies as it: i) controls the impact of spatiotemporal variations in air pollution and human mobility using multilocation-specific fixed and disjointed space-time strata ii) addresses the spatial heterogeneity of personal exposure separating its variable effect from other predictors by allowing different baseline hazards for each space-time stratum; iii) aligns case/control periods with strong/regular episodes of source-specific PM-multi-pollutant fingerprint contributions rather than health outcomes. This enabled comprehensive examination of the association between source-specific PM_{2.5}-bound species and cardiorespiratory disease hospitalizations. The

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Identification of antibiotic-resistant, gram-negative bacteria in sewage and bioaerosols from a wastewater treatment plant: A genotypic and phenotypic study

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ABSTRACT

Antimicrobial resistance (AMR) is a growing global public health concern. This study aimed to investigate the presence of bacteria and antibiotic resistance genes in the environment, more specifically in sewage and bioaerosol samples collected at a Wastewater Treatment Plant (WWTP). Bacterial species were identified and tested for antibiotic sensitivity. In addition, bla CTX-M, bla SHV, bla TEM and bla KPC genotypes, including those related to resistance to carbapenems, were detected by PCR. The results of this research are extremely important for understanding the mechanisms involved in antimicrobial resistance and for preventing the dissemination of these antibiotic-resistant microorganisms. This study contributes to the identification of sources of antibiotic resistance in the environment and implementation of AMR control and prevention strategies while preserving the effectiveness of antibiotics and public health.

Key words: bacterial resistance, bioaerosols, ESBL, public health, sewage treatment plant

HIGHLIGHTS

- Seventeen antibiotic-resistant bacterial strains were identified in sewage, sludge, and bioaerosol samples, showing microbial diversity and resistance.
- Critical resistance genotypes, including bla CTX-M, bla SHV, bla TEM, and bla KPC, were detected.
- Advanced techniques like PCR and electrophoresis accurately identified resistance genes in samples.
- Resistant bacteria in sewage pose significant environmental and public health risks, requiring control measures.
- *Burkholderia cepacia* complex with the bla KPC gene was found in bioaerosol samples at the WWTP, indicating the need for continuous monitoring.