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Introduction to the special issue on "COVID-19"

COVID-19 pandemic is wreaking havoc and bringing the whole world into a standstill in an unprecedented fashion. Joint efforts from multiple sectors to address the various aspects of environment and public health through usage of green technologies have become essential. The application of cleaner and effective technologies can be expanded to management and control, pollution mitigation and valorization of waste. In this Special Issue of *Geoscience Frontiers*, we present contributions addressing the interactions of COVID-19 in relation to environment and human health.

The topic of aerosol transmission of pathogenic respiratory diseases assumed a new dimension with the mid-late 20th century "Great Acceleration" of an increasingly hypermobile human population repeatedly infected by different strains of zoonotic viruses and has taken center stage this century in response to outbreaks of new respiratory infections that include coronaviruses (Moreno and Gibbons, 2022). The realization that SARS-CoV-2 is commonly spread from person to person via inhalable aerosols has focused attention on the understanding of how mitigation measures such as physical distancing, masks or type of ventilation affect viral transmission, especially in closed environments. In this context, particular attention has been given to public transport worldwide, with microenvironments such as buses (Bertone et al., 2022) and subway systems (Wei et al., 2022) containing a large number of travelers in a relatively small area and with possibly inadequate ventilation. Zorzi et al. (2022) used Revit software for Autodesk CFD 2021 generated 3D models of hospital environments. They found that the wind speed reached velocities up to 2.1 m/s when entering the building through open windows. In contact with the furniture, this value decreased to 0.78 m/s. In some internal isolation wards that house patients with COVID-19, areas that should be equipped with negative room pressure, air velocity was null. Relevant studies using computer techniques have proven very helpful in the investigation of how variations in airflow structures and ventilation modes can significantly reduce the exposure risk to passengers (Mikszewski et al., 2022). Also, the use of parameters such as the infectious emission rate can be fundamental for airborne transmission risk assessment. Numerical simulation methods for COVID-19 aerosol transmission in closed environments where people are not wearing face protection, such as restaurants or university campus food refectories, help highlight the importance of masking for both source control and personal respiratory protection from droplets exhaled from infected individuals (Zhao et al., 2022). Finally, COVID-19 lockdown has had an impact on air quality worldwide, with air pollution levels in megacities falling to previously unimaginable numbers (e.g. >40% decrease in PM in some Indian megacities, Chandra Pal et al., 2022), graphically demonstrating the positive impact of restricted vehicular movement and showing us an obvious way forward in improving the quality of life in our cities. In addition, Zhang et al. (2022a) found that the estimated radiation forcing efficiency of brown carbon (BrC) over 370–600 nm increased from 37.5 $W{\cdot}g^{-1}$ during the normal period to 50.2 $W{\cdot}g^{-1}$ during the lockdown, which is insights into the optical properties and radiative effects of source-specific BrC aerosol when pollution emissions are reduced.

In addition to air, the prevalence of SARS-CoV-2 RNA in environmental materials such as effluent, sludge or biosolids has indicated the inefficiency of some treatment systems currently used to inactivate and remove potentially infective virions (Adelodun et al., 2022). This not only highlights the importance of the use of adequate personal protective equipment for those employed in wastewater/sludge facilities, but also relates to agricultural workers spreading these materials in fields. Zhang et al. (2022b) critically reviewed the influential factors of pathogen migration, unravelling the impacts of pathogenic characteristics, vadose zone physiochemical properties and hydrological variables on the migration of typical pathogens in subsurface system. The distribution of viral traces in these and other materials can be followed using geospatial tools, an unusual example being offered by cemeteries potentially capable of acting as a source from which transport of the virus to surrounding areas can occur (Carollo et al., 2022). In the final contribution, Chelani and Gautam (2022) investigate the impact of lockdown during COVID-19 in some Indian cities and show that there is insignificant effects on persistent property of urban air quality. The papers presented in this special issue will be useful for those implementing public monitoring policies aimed at tracking and tracing the presence and predicted transmission of the SARS-CoV-2 virus, as well as emergent pathogens responsible for future pandemics.

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