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Normal and anomalous diffusion in fluctuations of dust concentration nearby emission source

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Highlights

- The study was focused on the particulate matter emerging as a result of man-made processes: machining and welding. The data on dust concentration was collected during measurements performed in industrial workplace environment, nearby emission sources of this kind. The study was based on single point measurements. The data was obtained and analyzed in the form of time series.
- We provided details of anomalous diffusion exponent estimation methods applied in this work. We present the analysis of fluctuations of dust concentration nearby various emission sources, based on diffusion exponent and autocovariance functions. The analysis served distinguishing homogeneous and heterogeneous character of PM concentration dynamics. They were associated with the case of normal and anomalous diffusion in fluctuations of dust concentration, respectively.
- Based on the obtained results, the homogeneous dynamics of PM concentration was rarely observed in the vicinity of emission sources while cases of heterogeneous dynamics were abundant. The analysis has practical implications for designing measurement strategy. The prevalence of heterogeneous character of PM concentration dynamics in indoor air votes against simplistic approach to PM concentration measurement indoors. As anomalous diffusion models are numerous and complex, the proper characterization of this system requires long term measurements performed at high sampling frequency

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