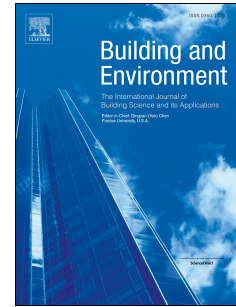


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Human exhalation characterization with the aid of schlieren imaging technique

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1

2 **Abstract**

3 The purpose of this paper is to determine the dispersion and distribution characteristics of
4 exhaled airflow for accurate prediction of disease transmission. The development of airflow
5 dynamics of human exhalation was characterized using nonhazardous schlieren photography
6 technique, providing a visualization and quantification of turbulent exhaled airflow from 18
7 healthy human subjects whilst standing and lying. The flow shape of each breathing pattern
8 was characterized by two angles and averaged values of 18 subjects. Two exhaled air
9 velocities, u_m and u_p , were measured and compared. The mean peak centerline velocity, u_m
10 was found to decay correspondingly with increasing horizontal distance x in a form of power
11 function. The mean propagation velocity, u_p was found to correlate with physiological
12 parameters of human subjects. This was always lower than u_m at the mouth/nose opening, due
13 to a vortex like airflow in front of a single exhalation cycle. When examining the talking and
14 breathing process between two persons, the potential infectious risk was found to depend on
15 their breathing patterns and spatial distribution of their exhaled air. Our study when combined

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