Spreading of polydisperse droplets in a turbulent puff of saturated exhaled air

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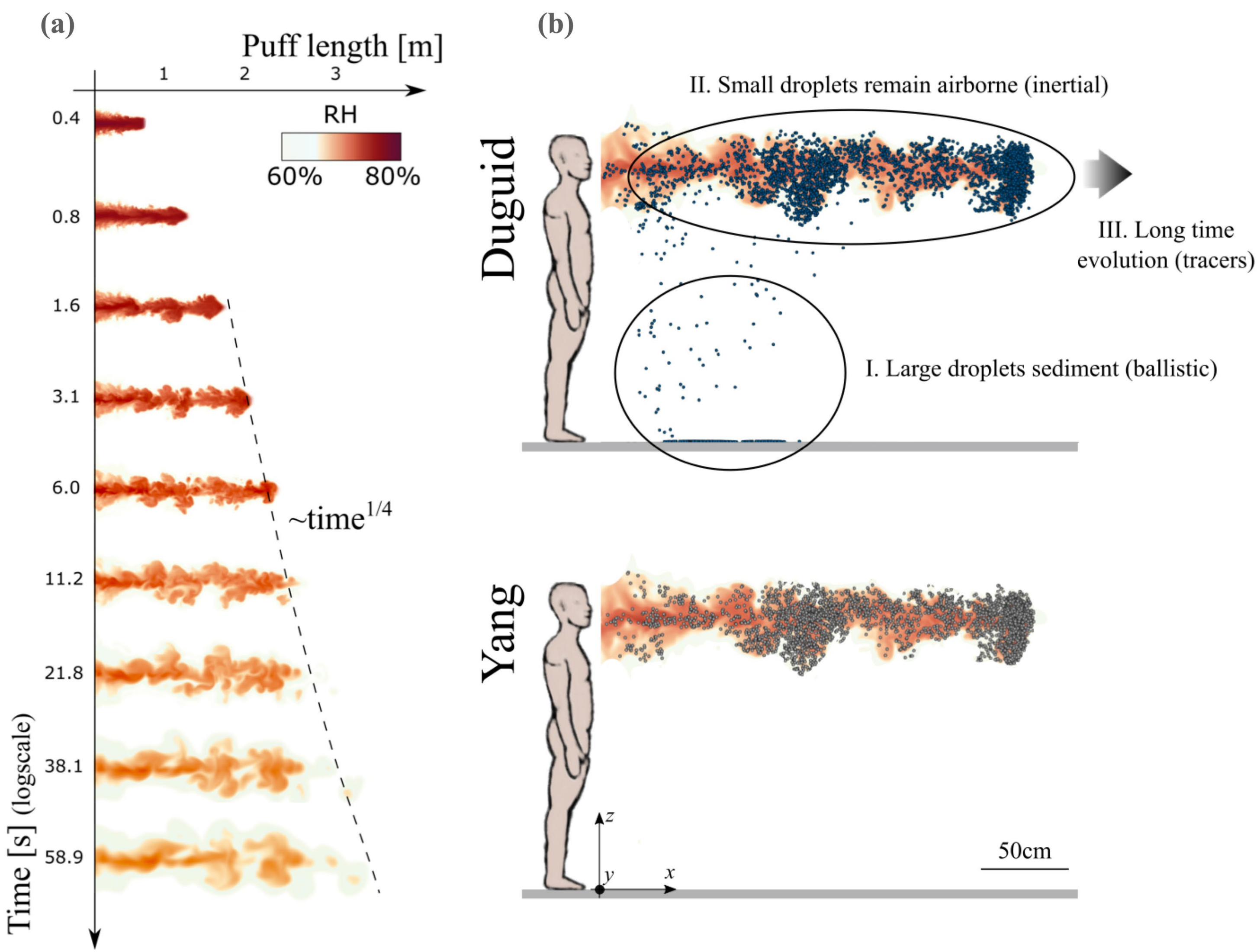
FIGHT Against COVID-19

- The primary way for transmission of Covid-19 and similar infections is the exhalation/inhalation of respiratory saliva droplets.
- We perform fully resolved numerical simulations at unprecedent resolution and accuracy of the turbulent flow exhaled during coughing or sneezing, combined with an accurate modeling of the droplet evaporation mechanism.
- We study how the airborne droplet dynamics is influenced by several factors important for the virus control and spreading:
  - influence of the ambient conditions (humidity and temperature);
  - difference between male and female subjects.
- We aim to provide the optimal size and distance for barriers to prevent the transmission of airborne droplets.



Airflow generated during coughing. (a) Evolution of the relative humidity in space and time. (b) Relative humidity (color coded) and exhaled droplets (blue and gray spheres, not in scale) after 7.6s considering two different initial droplet size distributions showing the dramatic differences in predictions depending on the initial distribution of droplet sizes: (top) Duguid; (bottom) Yang et al.

- Rosti, M.E., Olivieri, S., Cavaiola, M. *et al.* Fluid dynamics of COVID-19 airborne infection suggests urgent data for a scientific design of social distancing. *Sci Rep* **10,** 22426 (2020). https://doi.org/10.1038/s41598-020-80078-7
  - More than 27000 reads!
  - Featured in several international news outlets!
- Rosti, M.E., Cavaiola, M., Olivieri, S. *et al.* Turbulence dictates the fate of virus-containing liquid droplets in violent expiratory events. PhysRevRes**, in press** (2021).