SARS-CoV-2-Atmospheric Transport[1]

The COVID-19[2] worldwide epidemic has expanded the interest in the scientific community toward the development and application of numerical tools to simulate the potential atmospheric transport of the virus SARS-CoV-2 from one person to another. Simulation tools may help in 1) assessing and minimizing the risk of contamination; 2) design and modify indoor environments (e.g., hospitals) in order to reduce workers and patients exposure; and 3) helping decision maker in establishing science-based prevention measures (e.g., safe distances).

We present below a list of selected publications and events.

- Airborne Transmission of SARS-CoV-2: A Virtual Workshop[3]

- Zannetti, P. (2020) From A to B – Simulation of Atmospheric Pathway[4]

  A basic summary of numerical methods available for simulating the atmospheric pathway of virus-contaminated droplets.

- Steven R. Hanna (2020): Letter to the editor on simple short range transport and dispersion (T&D) modeling of COVID-19 virus, indoors and outdoors, Journal of the Air & Waste Management Association, DOI: 10.1080/10962247.2020.1811611[5]

  An interesting outline of some simple basic methods for modeling the transport and dispersion of COVID-19 from a single source (e.g., a person coughing) at small distances and small times, both indoors and outdoors.

- Vuorinen V. et al. (2020) Modelling aerosol transport and virus exposure with numerical simulations in relation to SARS-CoV-2 transmission by inhalation indoor[6]

- Anderson E. (2020) Consideration of the Aerosol Transmission for COVID-19 and Public Health[7]

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1 Guide prepared by P. Zannetti (9/2020). For corrections/expansions please contact zannetti@envirocomp.org

2 https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it

3 https://www.nationalacademies.org/event/08-26-2020/airborne-transmission-of-sars-cov-2-a-virtual-workshop

4 Zannetti, P. (2020) From A to B – Simulation of Atmospheric Pathway. Keynote Speaker, Virtual Workshop on COVID-19: Challenges in Research and Education (https://www.astfe.org/courses/covid19/). Organized by the American Society of Thermal and Fluids Engineers (ASTFE). August 31, 2020 (https://www.envirocomp.com/zcv/From%20A%20to%20B%20%E2%80%93%20Simulation%20of%20Atmospheric%20Pathway.pdf). Video presentation: https://www.astfe.org/virtual_workshop_on_covid19/?access_key=ASTFE2020COVID-19 (start at 1:56:50)

5 https://doi.org/10.1080/10962247.2020.1811611

6 https://www.sciencedirect.com/science/article/pii/S0925753520302630?via%3Dihub

7 https://onlinelibrary.wiley.com/doi/full/10.1111/risa.13500

- Mittal, R. et al. (2020) The flow physics of COVID-19[8]
- Bourouiba, L. (2020) Turbulent Gas Clouds and Respiratory Pathogen Emissions - Potential Implications for Reducing Transmission of COVID-19[9]
- NIST Airflow Model Could Help Reduce Indoor Exposure to Aerosols Carrying Coronavirus[10]
- Indoor Air and COVID-19 Key References and Publications[11]
- Estimated Airborne Decay of SARS-CoV-2 (virus that causes COVID-19)[12]
- Chen, T. et al. (2020) A mathematical model for simulating the phase-based transmissibility of a novel coronavirus[13]
- Chaudhuri S. et al. (2020) Modeling the role of respiratory droplets in Covid-19 type pandemics[14]
- Dbouk, T. and Drikakis D. (2020) On coughing and airborne droplet transmission to humans[15]
- Beans, C. (2020) Fluid dynamics work hints at whether spoken word can spread COVID-19[16]
- Prabhakaran, H. (2020) Spread of the Novel Coronavirus (SARS-CoV-2): Modeling and Simulation of Control Strategies[17]
- A 3D model of a person coughing in an indoor environment – how an aerosol cloud travels in the air[18]
- Yan Z. and Lan, Y. (2020) Modeling COVID-19 infection in a confined space[19]

8 https://www.cambridge.org/core/journals/journal-of-fluid-mechanics/article/flow-physics-of-covid19/476E32549012B3620D2452F30F2567F1
9 https://jamanetwork.com/journals/jama/fullarticle/2763852
10 https://www.nist.gov/news-events/news/2020/06/nist-airflow-model-could-help-reduce-indoor-exposure-aerosols-carrying
11 https://www.epa.gov/coronavirus/indoor-air-and-covid-19-key-references-and-publications
12 https://www.dhs.gov/science-and-technology/sars-airborne-calculator
13 https://idpjournal.biomedcentral.com/articles/10.1186/s40249-020-00640-3
14 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7327718/
15 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7239332/
16 http://blog.pnas.org/2020/04/fluid-dynamics-work-hints-at-whether-spoken-word-can-spread-covid-19/
17 https://www.medrxiv.org/content/10.1101/2020.05.11.20098418v1.full.pdf
18 https://www.youtube.com/watch?v=WZSKoNGTR6Q
19 https://link.springer.com/article/10.1007/s11071-020-05802-4