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2020 EOL Seminar Series (Virtual)

COVID meets Cloud Physics: on the hygroscopic properties of saliva and phlegm, and implications for virus die-off

Dr. Jorgen Jensen
Scientist and Lead, Science and Instrumentation Group
Research Aviation Facility, NCAR Earth Observing Laboratory
jbj@ucar.edu

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TIME: 3:30 - 4:30 pm MT (21:30 UTC)

WEBCAST: www.ucar.edu/live?room=fl21022

ABSTRACT

Human exhaled drops (sputum) may originate as lung fluid, phlegm, saliva and nasal fluid. Fundamentally such drops are dilute saline solutions with added protein, lipids, etc. Thus their properties share similarities with atmospheric sea-spray drops, although with a higher organic contribution.

In relation to the current COVID pandemic, two critical areas are: (1) What are the hygroscopic properties of such exhaled drops, over what distances do they evaporate, and what drop sizes can be expected to fall out vs. what drop sizes will remain suspended as aerosol particles, and (2) given that drops will partially or fully evaporate, what are the relative humidity-dependent mechanisms that likely affect virus survivability.

This talk examines the chemical composition of such drops, and what likely happens when these exhaled drops partially or completely dry out. This is followed by a discussion of a classical sea-salt aerosol hygroscopicity study, with added results from another prior study of hygroscopic measurements of salt solution with bovine protein added (thus resembling human exhaled drops). These two studies, in combination with a very recent MS2 virus survivability study, is used to arrive at a threshold for a minimum relative humidity in hospitals, nursing homes, offices, etc., in order to maximize natural virus die-off rates (assuming that COVID and other viruses behave as MS2).

The speaker is not a medical specialist, thus the behavior of human exhaled drops is only approached from an atmospheric science point of view, looking at physical responses of such drops. Once the speaker has obtained access to NCAR's GNI laboratory (currently closed due to work-from-home order), a set of experiments will be conducted to quantify hygroscopic properties of human exhaled drops; these will be described in the talk.

Email questions during the talk to Uhrike Romatschke: romatsch@ucar.edu

For more information, contact Melissa Ward: mward@ucar.edu

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