



Intro to the COVID-19 Aerosol Transmission Estimator

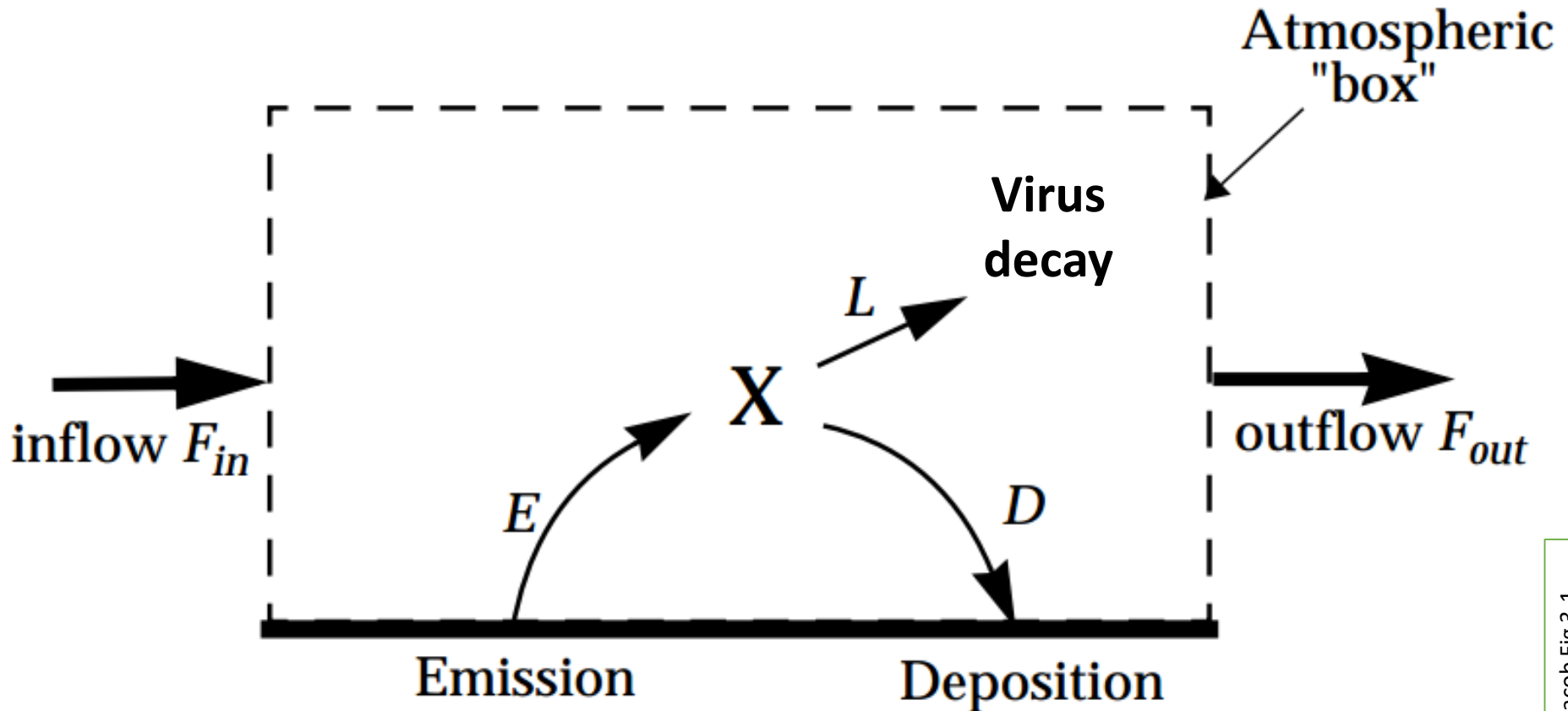
CU Chairs & Directors Mtg
16-Jul-2020

Prof. Jose L. Jimenez
University of Colorado-Boulder
Jose.jimenez@colorado.edu
<http://tinyurl.com/covid-estimator>

Very brief intro

- How did I learn all this?
 - Background on atmospheric aerosols, fluid mechanics, indoor air, modeling
 - Wingman to the giants (Morawska, Milton, Marr, Tang, Tellier, Nazaroff, Li...)
 - Investigated Skagit choir case (that's what convinced me)
- Big picture
 - Aerosol transmission was downplayed by WHO, CDC
 - Now evidence consolidating that it is major (tens of percent), likely dominant (> 50%). Not a single good argument against it that I know of
 - Find me in Twitter for details (@jljcolorado)
 - Still fomites (touching) and droplets (cough and sneeze) probably transmit, so keep washing hands etc.
 - Aerosol transmission:
 - COVID-19 not very contagious like measles, we have to “help it along”
 - Worst: face to face (“close contact”) so keep distance of 2 meters
 - Smoke visualizes it well. But you can smell smoke much farther than you can get COVID-19
 - Room-level transmission
 - Aerosols get mixed in the room, can build up to infective levels
 - Helped by indoors, low ventilation, long time, many people, no masks, talking or shouting / singing
 - No evidence of long range transmission (e.g. through HVAC), possible but seems pretty unlikely
 - Outdoors much much safer (dilution, UV)

Simple box model of room-level transmission



- Same as modeling radon, what I teach on first two lectures of CHEM-5152
- Simple differential equations, any professor in science & engineering at CU can understand if they put their mind to it
- Implemented in spreadsheet
 - Read "readme" and "FAQs" if interested

How to think about the model

- Math structure will stay the same
- Some parameters will be refined as research accumulates
- Three benefits:
 - Get “order-of-magnitude” of risk: e.g. if you get 3% it may really be 1% or 10%, but it is not 100% or 0.01%
 - Understand impact of control measures
 - Meet outdoors when feasible
 - Changes in ventilation (CU already optimizing – amazing work)
 - Portable HEPA filter units (CU already going)
 - Importance of wearing masks
 - Never remove mask to speak! (Fauci set wrong example recently)
 - Reducing density of people
 - Reducing duration
 - Understand the physical processes, so that you can think of other creative approaches
- Beware conditional probability (1 infected present) vs. absolute probability (uses disease prevalence to estimate probability of someone infected present)
 - Will update this afternoon to make clearer
- This is only room-level aerosol. Close contact, fomites add risk on top

Example of Skagit Choir & Controls

- What happens if we could change conditions
- All are changing only 1 thing, except “do all previous indoors”

